Vehicle Technology and Trends 2013

Module 1

I-CAR®

NEW13-INMAN1-E

IMPORTANT NOTICE

This material provides general directions for collision damage repair using tested, effective procedures. Following them will help assure the reliability of the repair.

I-CAR cannot accept responsibility for any individual repair, nor can it warrant to the quality of such repair. Anyone who departs from the instructions in this program must first establish that neither personal safety nor the integrity of the repair of the vehicle is compromised by the choice of methods, tools, or supplies.

I-CAR does not endorse or recommend any brands or makes of vehicles, repair equipment and supplies or other products. The appearance of various makes and brand names in any I-CAR material is purely coincidental and is based on the availability of those products at the time of production.

All recommendations presented in this program are based upon research programs or upon tests conducted by laboratories, manufacturers, or selected collision repair facilities. If performed as outlined, these recommendations will provide the basis for a thorough, professional repair.

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Class 0:49

A-1

MODULE 1–TRENDS AND INDUSTRY INFLUENCES

Topic A. Manufacturing Trends

Learning Objectives

Learning objectives for this module include:

- **describing manufacturing trends prompted by necessity or consumer demand.**
- **describing manufacturing trends prompted by government mandates.**
- **describing new repair technologies.**

Learning objectives for this module include:

- describing manufacturing trends prompted by necessity or consumer demand.
- describing manufacturing trends prompted by government mandates.
- describing new repair technologies.

Notes

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Topic A. Manufacturing Trends (cont'd)

A-2

A Look At What's New

Acura NSX Concept

This course is a glance at what is coming into repair facilities. It is designed to present and discuss trends and technologies relevant to the collision repair industry introduced for the 2013 model year.

"Vehicle Technology and Trends 2013" is different from some other I-CAR courses in that:

- it is not a "How-To" type of course, detailing procedures for repair.
- there are limited details on many of the subjects introduced. It is intended to be an overview of the technology and trends. More information on many of the subjects is or will be covered in other I-CAR training courses.
- some concept information is presented to provide information on possible directions the industry is heading toward. This information is all in the last module. The rest of the course, 85% of the information, is about vehicles and technology on the road today.

Notes

It may be helpful to ask how many students attended the I-CAR live "Vehicle Technology and Trends 2010 (NEW10)" and "Vehicle Technology and Trends 2011 (NEW11)," as this course is laid out similarly.

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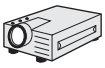
Topic A. Manufacturing Trends (cont'd)



A-3v

Video: Tech/Trends Trivia

Notes

Explain that this is the first of many trivia questions that will be asked throughout the course. Set up the rules for answering the questions, depending on the size of the class and other factors. A prize could be awarded at the end of the class to whoever accumulates the most correct answers. If you will be awarding a prize, it could be announced at this time. Work with committee members to obtain a prize.

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Topic A. Manufacturing Trends (cont'd)

A-4

Aluminum Demand Rises

Mercedes-Benz SL

One of the major trends for the 2013 model year, from a body perspective, is a rise in the use of aluminum. The use of this construction material lowers the weight of vehicles for more fuel efficiency. As the 2025 deadline looms for U.S. vehicle makers to achieve a corporate average fuel economy (CAFÉ) of 54.5 miles per gallon, many vehicle makers are turning toward aluminum for part of the answer. Examples of this trend include:

- Alcoa Aluminum expanding its Iowa facility primarily due to the rising demand from vehicle makers. A spokesman for the company said that the expansion is for business already secured. Alcoa expects that growing demand for aluminum from the auto industry will cause aluminum shortages in the near future. Another aluminum panel maker, Novelis, is tripling its U.S. production capacity of automotive sheet aluminum and expanding their plant in Oswego, New York.

Notes

There will be more information on the 2013 Mercedes-Benz SL in Module 4.

Objectives Worksheet

One of the major trends for the 2013 model year is a rise in the use of aluminum. The use of this construction material lowers the weight of vehicles for more fuel efficiency. As the 2025 deadline looms for U.S. vehicle makers to achieve a corporate average fuel economy (CAFÉ) of 54.5 miles per gallon, many vehicle makers are turning toward aluminum for part of the answer.

Mercedes-Benz released what they call their first high-production, aluminum-intensive vehicle, the SL, in 2013.

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Topic A. Manufacturing Trends (cont'd)

- Honda saying that they are reaching the limits of high-strength steel (HSS).
- Mercedes-Benz releasing what they call their first high-production, aluminum-intensive vehicle, the SL.

Another example of the rising popularity of aluminum is the release of another I-CAR live course on aluminum repair, *"Aluminum-Intensive Vehicle Repairs (ALI01)."*

Notes

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Topic A. Manufacturing Trends (cont'd)

A-5

Aluminum Demand Rises (cont'd)

Porsche 911

Other examples of the trend toward aluminum for vehicle makers include:

- Tata Motors saying that all future Land Rovers and Jaguars will be aluminum-intensive.
- Porsche saying that most future Porsche vehicles will have an aluminum/steel structure, similar to the 2013 911.

A 2011 survey of North American vehicle makers reports that aluminum is expected to increase in use from 154 kilograms (340 pounds) per vehicle today to 249 kilograms (550 pounds) per vehicle in 2025.

Notes

There will be more information on the 2013 Porsche 911 in Module 4.

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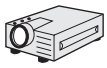
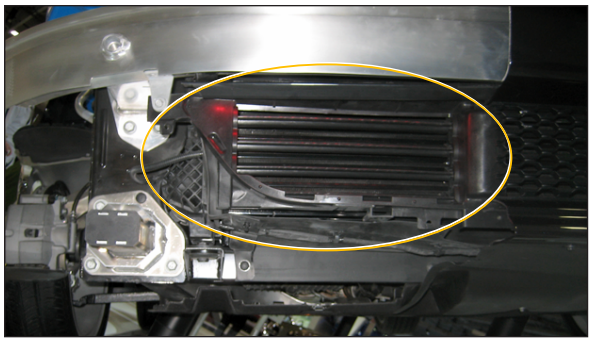
Topic A. Manufacturing Trends (cont'd)



A-6

More Active Grille Shutters



A gadget designed to provide better fuel efficiency is an active grille shutter. Active grille shutters automatically open at low speeds to allow more airflow over the engine for cooling, and automatically shut to improve aerodynamics at high speeds. Wind tunnel tests have shown these systems contribute nearly 0.2 kilometer/liter (0.5 mile/gallon) in combined city and highway driving. These systems can be found as standard or optional on the 2013:

- Chevrolet Malibu Eco and the other GM Eco-assist vehicles.
- Dodge Dart.
- Ford Escape and Taurus.
- Ram 1500.

Notes

Objectives Worksheet

Active grille shutters automatically open at low speeds to allow more airflow over the engine for cooling, and automatically shut to improve aerodynamics at high speeds. All of the shutters are linked together, so one obstruction can bind the entire system.

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Topic A. Manufacturing Trends (cont'd)

Active grille shutters require inspection after a frontal collision, since the parts are just behind the grille. Look for obstructions that might prevent proper operation. All of the shutters are linked together, so one obstruction can bind the entire system. There is also electronics involved, including sensors, an actuator motor, connector, and wiring harness. All of these require inspection after a front collision.

Notes

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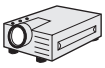
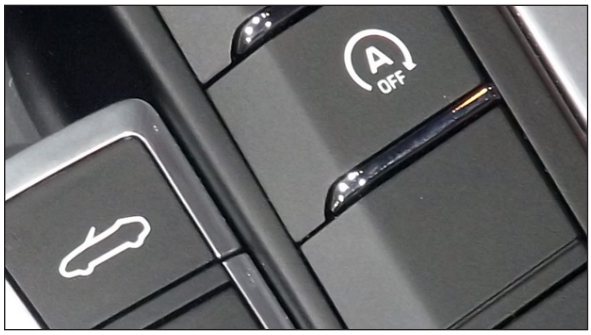
Topic A. Manufacturing Trends (cont'd)



A-7

Stop/Start Systems On Non-Hybrids



Stop/start systems are designed to stop the engine when at idle, such as at stoplights, and automatically start the engine again when the driver releases the brake pedal. All other systems that run off the engine, such as air conditioning, continue to operate. This is a common feature on hybrid vehicles. In 2013, they start to appear on non-hybrid vehicles in the U.S.

Stop/start systems:

- add to fuel efficiency and lower emissions. A U.S. Treasury report says Americans, as a whole, waste 1.9 billion gallons of gasoline per year in engine idle situations, such as traffic jams. Some countries have passed regulations to discourage idling. In Canada, for example, there is a law that makes idling in boats, vehicles, and even buses for more than one minute per hour punishable by a fine of up to $5,000.
- are featured on the 2013 Ford Fusion and Porsche 911 Carrera and Panamera. The 2013 Ram 1500 also features a stop/start system.

Notes

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Topic A. Manufacturing Trends (cont'd)

- have been popular in Europe since the 2010 model year. Volkswagen was the first to introduce a stop/start system on a Europe-only model in 1983. U.S. manufacturers felt the feature was not worth the extra expense in previous years. Adding a stop/start system does not change the numbers on the EPA mileage window sticker, since that test does not include stop-and-go traffic situations. Currently, there is only one stop in the EPA test.

Stop/start systems typically work by enhancing the starter motor, so it can handle the on/off cycling and provide seamless engine starts once a driver releases the brake pedal. A strong 12-volt battery and an electric pump allow the heating, ventilating, and air conditioning (HVAC) system to continue operating with the engine off.

Notes

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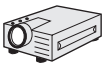
Topic A. Manufacturing Trends (cont'd)



A-8

Coasting Without The Engine

Porsche 911

Still another fuel-saving feature appearing on more vehicles is the engine disengaging when coasting at highway speeds or on slight downhill gradients, a feature called "coasting." Application examples include the:

- BMW ActiveHybrid 5.
- VW Jetta Hybrid.
- Porsche 911 Carrera and Panamera, both non-hybrids.

On hybrid applications, the engine switches completely off and the electric motor takes over. On the Porsche models, the engine still runs, but at idle speed.

Notes

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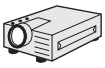
Topic A. Manufacturing Trends (cont'd)



A-9

More Diesels In U.S. Market

Diesels are being introduced in more numbers in the U.S. market. Evidence for 2013 includes:

- GM announcing the introduction of a diesel Chevrolet Cruze. A diesel Cadillac ATS is also being discussed.
- Porsche introducing a diesel Cayenne model in the U.S.
- Volkswagen offering a diesel Beetle and diesel Passat.

For several years, diesel-fueled vehicles have amounted to about half of all vehicle sales in Europe. One reason is that diesel is less costly than highly taxed gasoline in Europe, but another reason is that diesel has better fuel efficiency than gasoline.

Notes

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Topic A. Manufacturing Trends (cont'd)

A-10

More Plug-In Hybrids For 2013

Volvo XC60

The number of plug-in hybrids is still growing. The trend that started with the Chevrolet Volt and Fisker Karma continues with the 2013:

- Toyota Prius.
- Ford Fusion Energi.
- Ford C-MAX.
- Honda Accord.

Beyond 2013, there are plans for a plug-in hybrid:

- Cadillac.
- Mitsubishi Outlander.
- Volvo XC60.

Some vehicle makers, such as Nissan and Porsche, have dropped their hybrid models, and pure-electric vehicle makers are fewer. The Norwegian company that made the Think! electric vehicle has closed. Aptera, which was trying to get a pure-electric vehicle up and running, no longer exists.

Notes

Objectives Worksheet

The number of plug-in hybrids is still growing. The trend that started with the Chevrolet Volt and Fisker Karma continues with the 2013:

- Toyota Prius.
- Ford Fusion Energi.
- Ford C-MAX.
- Honda Accord.

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Topic A. Manufacturing Trends (cont'd)

On the other hand, Coda Automotive, another small vehicle maker trying to make a mark in the U.S. with a pure-electric sedan, is still selling the Coda pure-electric to California residents online. Also, the pure-electric Nissan Leaf is now available for a test drive at any Nissan dealership in the U.S.

Notes

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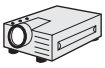
Topic A. Manufacturing Trends (cont'd)



A-11v

Video: Tech/Trends Trivia

Notes

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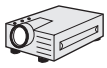
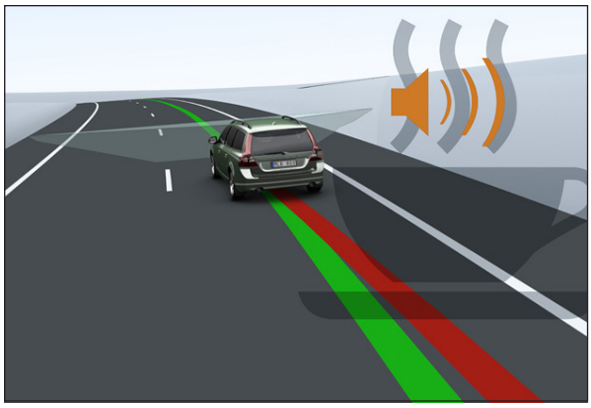
Topic A. Manufacturing Trends (cont'd)



A-12

Technology Trickles Down



Courtesy of Volvo Cars of North America

Another trend for the 2013 model year is the trickling down of technology that was once only available on luxury class vehicles. This same technology is now standard or optional on other vehicles. For this reason, repairers must stay up to date and become familiar with repair requirements on advanced electronic systems.

Examples of these systems include:

- lane departure warning. This is a safety feature that lets a driver know they have begun to cross over lane markers without signaling. Lane departure warning systems use cameras to sense the lane markings on pavement. Warnings to the driver may be audible or take the form of a vibration in the steering wheel or seat. Lane departure alert is required for a five-star safety rating from the National Highway Traffic Safety Administration (NHTSA).

Notes

Objectives Worksheet

A trend for the 2013 model year is the trickling down of technology that was once only available on luxury class vehicles. This same technology is now standard or optional on other vehicles. Examples of these systems include:

- lane departure warning.
- driver alert warning.
- blind spot warning.

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Topic A. Manufacturing Trends (cont'd)

- driver alert warning. Driver alert warning systems look for signs of an inattentive or tired driver. There are several ways to monitor the alertness or attention of a driver that range from lane departure to monitoring the driver's movements with cameras. The driver is warned with audible or visual alarms to take a break.
- blind spot warning. This warning system uses a radar or camera to detect and warn a driver that another vehicle is approaching in an adjacent lane. There may be an amber light on the door mirror when a vehicle is in the driver's blind spot. If the driver signals to move in that direction, an audible alert or flashing light is activated.

Notes

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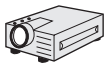
Topic A. Manufacturing Trends (cont'd)



A-13

Technology Trickles Down (cont'd)

Other examples of technology systems that are now more readily available include:

- adaptive cruise control. This feature uses radar or a laser to project a beam forward and maintain a set distance from the vehicle ahead. Some systems will also apply the brakes when needed to maintain a safe following distance, or even stop the vehicle completely.
- automatic high beams, which have a sensor to switch headlamps to high beam when no oncoming traffic is detected. The 2013 Ford Taurus is so equipped.
- brake assist. This feature, now standard equipment in some vehicles, recognizes when a driver wants to emergency stop. The system then applies full braking power, even if the driver has not pressed the brake pedal hard enough to do this. If the driver backs off the brakes, the system is overridden.

Notes

Objectives Worksheet

Other examples of technology systems that are now more readily available include:

- adaptive cruise control.
- automatic high beams.
- brake assist.
- park assist.

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Topic A. Manufacturing Trends (cont'd)

- park assist. This system alerts the driver with an audible beep when the vehicle is getting close to an object. There may also be a backup camera, which shows the area directly behind the vehicle when in reverse. Park assist also includes parallel parking with minimal input from the driver.

More information on damage analysis of systems such as lane departure warning and brake assist can be found in the I-CAR live *"Damage Analysys Of Advanced Automotive Systems (DAM07)."*

Notes

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Topic A. Manufacturing Trends (cont'd)

A-14

More Autonomous Braking Systems

2013 Ford Escape

What the industry terms "autonomous braking systems" is in a separate trend category. These systems apply the brakes when the driver does not. Autonomous braking started with the Volvo "City Safety" system on the XC60 in 2010. 2013 examples include:

- Subaru "Eyesight Driver Assistance," found on the 2013 Subaru Legacy and Outback. This system is similar to the Volvo City Safety system.
- Ford "Curve Control," such as is found on the 2013 Escape. This system automatically brakes the vehicle if it is going too fast around a curve, preventing the driver from losing control or the vehicle tipping.
- Infiniti "Backup Collision Intervention" on the JX. The Infiniti system features a mix of radar in the quarter panels for cross traffic, and rear sonar sensors for objects in the rear. When backing up, the system gives the driver warning beeps and red lights. If the brakes are not applied, the system takes over and stops the vehicle.

Notes

There will be more on these individual examples with the different vehicle makes in the following modules.

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Topic A. Manufacturing Trends (cont'd)

A-15

Busy Steering Wheels

Infiniti M35h

Ford Focus ST

Subaru Outback

There is a trend to put more controls within the driver's reach, especially on the steering wheel. Many 2013 vehicles have busy steering wheels and center consoles.

Controls on the steering wheel may include settings for:

- cruise control.
- the radio, both station selection and sound levels.
- the navigation system.
- a hands-free telephone.
- paddle shifting.

This is in addition to turn signals, windshield wipers, and the horn.

Notes

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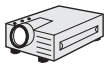
Topic A. Manufacturing Trends (cont'd)



A-16

Use Of Synthetic Oil

Volvo decided that synthetic oil will be standard on all Volvo models as of the 2013 model year. At least for Volvo, synthetic oil is just not a recommendation, but a requirement for the new vehicle warranty. The warranty will be void if synthetic oil is not used. Volvo specifically references "Castrol" oil, a brand known for its synthetics.

European vehicle makers have been switching to synthetic oil for several years now. Other vehicle makers from North America and Asia have also embraced synthetic oil. Toyota, for example, has been phasing in the recommendation on Toyota, Lexus, and Scion models since 2011.

The reason for synthetic oil includes:

- reduced friction and wear.
- fewer oil changes, which is better for the environment. For Volvo, 2013 will be the beginning of the 10,000 mile oil change interval recommendation.

Notes

Objectives Worksheet

Volvo announces synthetic oil will be standard on all Volvo models as of 2013. At least for Volvo, synthetic oil is just not a recommendation, but a requirement for the new vehicle warranty. The reason for synthetic oil includes:

- reduced friction and wear.
- fewer oil changes. For Volvo, 2013 will be the beginning of the 10,000 mile oil change interval recommendation.

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Topic A. Manufacturing Trends (cont'd)

A-17

Capless Fuel Fillers

Not having to worry about the fuel filler cap is catching on, at least in the North American market. Ford was the first vehicle maker to introduce a capless fuel filler, on the 2009 Explorer. In 2010, that was extended to all Ford and Lincoln vehicles. Chrysler added the feature on the 2011 300 and Dodge Charger, then GM on the 2013 Cadillac XTS.

There are pros and cons of capless fuel fillers. Pros include not having to worry about the cap getting lost when doing a repair, or scratching the finish when the cap is dangling. Also, the cap can be screwed on the wrong way, triggering a dash lamp. One con is that a special, vehicle maker-supplied funnel is required when adding fuel from a fuel container. This makes it less likely someone will siphon the fuel from the tank, but the funnel is another part that can get lost.

Notes

Objectives Worksheet

Ford was the first vehicle maker to introduce a capless fuel filler, on the 2009 Explorer. Chrysler added the feature on the 2011 300 and Dodge Charger, then GM on the 2013 Cadillac XTS. The 2013 ATS does not have a capless fuel filler.

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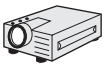
Topic A. Manufacturing Trends (cont'd)



A-18v

Video: Tech/Trends Trivia

Notes

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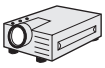
Topic A. Manufacturing Trends (cont'd)



A-19

The Rise Of Matte Finishes

Mercedes-Benz SL

There is a trend toward matte finishes, which is a finish without the gloss. There is still a clearcoat for ultraviolet ray protection, but the clearcoat has an added flattening agent. A matte finish can also be achieved at a lesser cost with a "matte wrap."

With a matte finish:

- there are no reflections, so all that is seen is the vehicle shape and color, what vehicle makers call "the pure design."
- the basecoat can be any color, not just white, black, and gray. All colors work with matte finishes.
- wax is never applied. Wax would shine, which is what is being avoided.

There will be information on repair of matte finishes later in this module.

Notes

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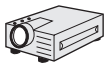
Topic A. Manufacturing Trends (cont'd)



A-20

Factory-Built Compressed Natural Gas (CNG)

There are at least two more factory-built compressed natural gas (CNG) vehicles for the 2013 model year, making this a trend. These vehicles include:

- the Ram 2500 Heavy Duty pickup, which seamlessly switches over to gasoline operation when the two CNG tanks are empty. Twin 4.6 cubic foot tanks, located next to each other in a box in front of the bed, store the equivalent of 18.2 gallons of gasoline.
- a GM Silverado and GMC Sierra 2500 Heavy Duty pickup.
- the Honda Civic GX, which has been available in select states for several years. The GX is now available in 36 states.

Ford has offered factory-made pickup and van CNG conversions since 2009.

Notes

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Topic A. Manufacturing Trends (cont'd)

CNG is less expensive and cleaner burning than gasoline, and is produced in the U.S. A problem is that it is available only at a relatively few fueling stations. As of March 2012, there were only about 1,500 CNG fueling stations in the U.S., and only half of these were accessible to the public. Most CNG fueling stations are operated by local governments or private companies for refueling CNG buses and other fleet vehicles.

Notes

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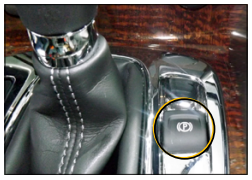
Topic A. Manufacturing Trends (cont'd)

A-21

More Electronic Parking Brakes

Chevrolet Impala



Chevrolet Traverse

Ford Fusion

For many vehicle models in 2013, putting on the emergency parking brake no longer requires pulling a lever or pushing a pedal, but pushing a button and letting an electrical circuit do the rest of the work. Electronic parking brakes:

- appeared first only on European makes, starting with Renault in 2001.
- are on several models for 2013, including Fords, GMs, Lexus models, and more.
- consist primarily of a switch, control module, and specially designed rear brake calipers. The brake calipers contain an electric motor, gearbox, and a shaft that presses on the brake pad when the switch is activated. There may be a self-locking thread on the shaft to retain the pressure on the pad when the vehicle is turned OFF.

Notes

Objectives Worksheet

For many vehicle models in 2013, putting on the emergency parking brake no longer requires pulling a lever or pushing a pedal, but pushing a button and letting an electrical circuit do the rest of the work. These are electronic parking brakes.

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Topic A. Manufacturing Trends (cont'd)

- have pros and cons. Pros include that there is more room without the brake lever, and the brake works in conjunction with the anti-lock brakes, so there is no possibility of brake lockup. Cons include that in an emergency stop, the button cannot be pressed any harder. Some electronic parking brakes do not work when the vehicle is moving forward, so assisting an emergency stop is not even possible. Another con is that this is another example of a button taking away manual control of the vehicle.

Notes

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Topic A. Manufacturing Trends (cont'd)

A-22

More Active Noise Cancellation Systems

Ford Fusion

Active noise cancellation systems, which reduce perceived noise from the engine, have become more complex and grown in numbers. These systems:

- are on more vehicles due to customer demand.
- have increased capabilities.
- use the existing audio system in the vehicle, as well as other parts.
- may have speakers in the headliner to augment the system.
- can be found, for example, on the 2013 Ford Fusion and Buick Encore.

Notes

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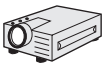
Topic A. Manufacturing Trends (cont'd)



A-23v

Video: Buick Noise Cancellation

This video shows parts of the active noise cancellation system on the 2013 Buick Encore.

Notes

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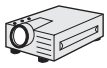
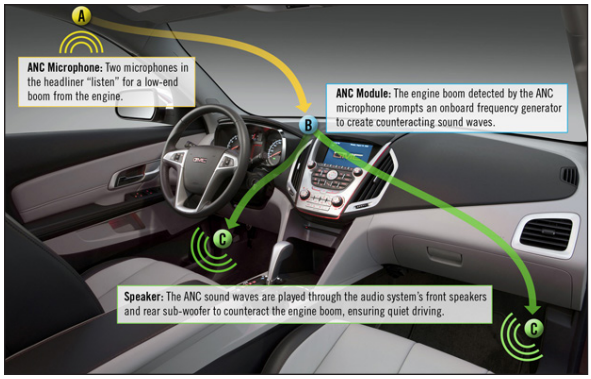
Topic A. Manufacturing Trends (cont'd)



A-24

GM Active Noise Cancellation (ANC) System


A
ANC Microphone: Two microphones in the headliner "listen" for a low-end boom from the engine.
B
ANC Module: The engine boom detected by the ANC microphone prompts an onboard frequency generator to create counteracting sound waves.
C
Speaker: The ANC sound waves are played through the audio system's front speakers and rear sub-woofer to counteract the engine boom, ensuring quiet driving.
C

© General Motors

The GM active noise cancellation (ANC) system:

- is only designed to cancel engine noise up to 2,000 RPM. It does not eliminate air leaks, road noise, or any other sounds from reaching the cabin interior.
- has four main parts:
  - The active noise cancellation module (computer)
  - Two microphones in the headliner to monitor the engine noise that is reaching the cabin interior
  - The audio amplifier, which sends out the noise cancellation tones, and the speakers
  - The subwoofer in the audio system, which is used for producing the noise cancellation tones

The system is electronic, and requires a scan tool and service information to troubleshoot the diagnostic trouble codes.

Notes

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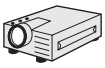
Topic B. Trends Due To Mandates



B-1v

Video: Tech/Trends Trivia

Notes

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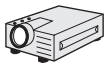
Topic B. Trends Due To Mandates (cont'd)



B-2

Mandatory Side Curtain Airbags

All passenger vehicles operating in North America must have side curtain airbags as of model year 2013, per a ruling by the National Highway Traffic Safety Administration (NHTSA). Side curtain airbags must provide head and torso protection.

Side impact airbags that deploy from the seat backrest or door panel are not mandated, but most vehicles are equipped with them.

Notes

Objectives Worksheet

All passenger vehicles operating in North America must have side curtain airbags as of model year 2013, per a ruling by the National Highway Traffic Safety Administration (NHTSA). Side impact airbags are not mandated, but most vehicles are equipped.

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Topic B. Trends Due To Mandates (cont'd)

B-3

Better Curtain Airbags

Ford Explorer Cutaway

A new NHTSA ruling being phased in from 2013 to 2017 mandates an improved style of curtain airbags. This ruling:

- is Federal Motor Vehicle Safety Standard (FMVSS) 226 Ejection Mitigation.
- requires the side curtains to assist in ejection mitigation, which prevents occupants from being ejected through side windows in a rollover, even if the window is rolled down or destroyed.

Vehicle makers can meet this requirement in various ways. NHTSA anticipates that vehicle makers will modify the existing side curtains, possibly supplementing them with stronger glass. The new side curtains will likely have to:

- be larger to cover more of the window opening.
- stay inflated at least six seconds. Side curtains designed only for occupant protection generally stay inflated for less than one-tenth of a second.

Notes

Objectives Worksheet

A new NHTSA ruling being phased in from 2013 to 2017 mandates an improved style of curtain airbags. This ruling requires the side curtains to assist in ejection mitigation, which prevents occupants from being ejected through side windows in a rollover, even if the window is rolled down or destroyed.

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Topic B. Trends Due To Mandates (cont'd)

- be thicker, more robust, than current styles.
- have an attaching tether near the base of the airbag, preventing it from flopping out of the way during a rollover.

More information on the final rule of FMVSS 226 Ejection Mitigation can be found at: www.federalregister.gov. Do an article search for "FMVSS 226."

Notes

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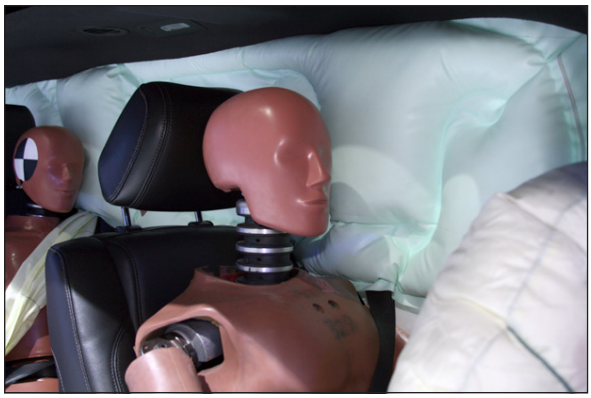
Topic B. Trends Due To Mandates (cont'd)

B-4

Better Curtain Airbags (cont'd)



The first side curtains to deploy in a rollover appeared as an option on the Ford Explorer and Mercury Mountaineer in 2002. It was called the "safety canopy." Ford is also ahead of the phase-in time for the ejection mitigation requirements, in that the side curtains on the 2013 Ford Escape stay deployed for six seconds.

Notes

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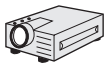
Topic B. Trends Due To Mandates (cont'd)



B-5

Brake Throttle Override Systems

NHTSA is considering requiring all passenger cars and trucks be equipped with brake throttle override systems, where the input to the brake pedal has the capability of overriding input to the accelerator pedal.

Most 2012 vehicles are already equipped. The trend owes its popularity to the much-publicized claims a few years ago of some Toyota vehicles accelerating on their own. The cause was thought to be electronic, resulting in a worldwide recall of nearly 19 million vehicles. A federal probe determined in early 2011 that the cause was floor mats entrapping the gas pedal.

NHTSA aims to minimize the risk of drivers losing control of their vehicles due to the accelerator getting stuck open for any reason.

More information on this proposed rule can be found at: www.federalregister.gov. Do an article search for "brake throttle override."

Notes

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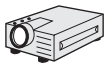
Topic B. Trends Due To Mandates (cont'd)



B-6

Standard Event Data Recorders

Event Data Recorders

This vehicle is equipped with an event data recorder (EDR).
record, in certain crash or near crash-like situations, such a
road obstacle, data that will assist in understanding how a
is designed to record data related to vehicle dynamics and
time, typically 30 seconds or less. The EDR in this vehicle is

- How various systems in your vehicle were operating;
- Whether or not the driver and passenger safety belts
- How far (if at all) the driver was depressing the accele
- How fast the vehicle was traveling.

From Cadillac ATS Owner's Manual

In 2006, NHTSA issued a ruling on event data recorders (EDRs) that applies to 2013 and later models. EDRs, popularly called "collision black boxes," are devices that record certain information from a vehicle immediately before and during a serious collision. The ruling does not require EDRs be in all vehicles, though most vehicles contain an EDR. The ruling does:

- include, among other things, 15 standard data elements that all EDRs must record. These include a change in forward speed, whether seat belts were in use, and whether or not the entire event was recorded. Advanced EDRs must record 30 data elements.

Notes

More information on this proposed rule can be found at: www.federalregister.gov. Do an article search for "Event data recorders."

If there are any questions as to what the 15 requirements are, as of model year 2013, all EDRs must record:

1. Change in forward crash speed
2. Maximum change in forward crash speed
3. Time from beginning of crash at which the maximum change in forward crash speed occurs
4. Speed vehicle was traveling
5. Percentage of engine throttle, percentage full (how far the accelerator pedal was pressed)
6. Whether or not the brake pedal was applied
7. Ignition cycle (number of power cycles applied to the EDR) at the time of the crash
8. Ignition cycle (number of power cycles applied to the EDR) when the EDR data was downloaded
9. Whether or not the driver was using a seat belt

Objectives Worksheet

In 2006, NHTSA issued a ruling on event data recorders (EDRs) that apply to 2013 and later models. The ruling does not require EDRs be in all vehicles, though most vehicles contain an EDR. The ruling does make retrieval of the data easier. The data is still owned by the vehicle owner, so there must be vehicle owner's consent before data can be released.

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Topic B. Trends Due To Mandates (cont'd)

- make retrieval of the data easier. Vehicle makers must publicly share information about how to download EDR data. Police, collision investigators, and others can download the data from the EDR memory to help them better understand what happened to the vehicle and how the safety systems performed. The data is still owned by the vehicle owner, so there must be vehicle owner's consent before data can be released.
- require a statement in the owner's manual telling consumers that their vehicle has an EDR.

In order to be classified as an EDR, the device must at least be able to record vehicle speed before a collision, or speed change during the impact.

Notes

10. Whether or not the frontal airbag warning lamp was on
11. Driver frontal airbag deployment: time to deploy for a single stage airbag, or time to first stage deployment for a multi-stage airbag
12. Right front passenger frontal airbag deployment: time to deploy for a single stage airbag, or time to first stage deployment for a multi-stage airbag
13. Number of crash events
14. Time between the first two crash events, if applicable
15. Whether or not the EDR completed recording

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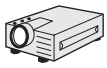
Topic B. Trends Due To Mandates (cont'd)



B-7

NHTSA Rearview Camera Requirement

NHTSA has proposed a new safety regulation requiring rearview cameras on all passenger vehicles by the 2014 model year. NHTSA has been considering requiring cameras since 2010, so many vehicle makers already have rearview cameras. The camera:

- provides a view behind the rear bumper.
- is considered better than park-assist sensors, which only provide an audible signal when the vehicle is getting close to something or someone.
- also offers a partial view of the blind spot, though the rearview camera is not considered a blind spot detection device.

Notes

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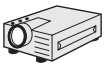
Topic C. New Equipment, Repair Procedures



C-1v

Video: Tech/Trends Trivia

Notes

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Topic C. New Equipment, Repair Procedures (cont'd)

C-2

Repair Of Matte Clearcoat

Audi R8

Paint maker Standox has listed some guidelines for repairing matte finishes. In general, more time and more materials are required than when repairing gloss finishes.

With matte finishes:

- do not sand or polish. This would add gloss.
- do not dab away tiny stone chips, or polish away minute scratches on panels, such as fingernail marks in door handle recesses. Do not even use a clay bar to remove a finish defect. Any of these results in small areas of gloss, which impair an otherwise evenly matte surface.
- blend-in repairs are not possible, as they would reduce the overall appearance. The entire panel must be repaired. Depending on where the damage is, it may even be advisable to repair a complete vehicle side.

Notes

Objectives Worksheet

With matte finishes:

- do not sand or polish.
- do not use a clay bar to remove a finish defect.
- blend-in repairs are not possible, as they would reduce the overall appearance. The entire panel must be repaired. Depending on where the damage is, it may even be advisable to repair a complete vehicle side.
- never use infrared curing. Air drying or forced oven drying also have different influences on the degree of gloss.

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Topic C. New Equipment, Repair Procedures (cont'd)

- do not use a mixing stick for formula amounts, but weigh the quantities of refinish clearcoat needed on the scale. Even minor deviations from the right mixing ratio of hardener, clearcoat, and thinner lead to changes in the level of non-gloss.
- correct flash off is important. To avoid glossy areas, the intermediate and final flash-off times in the technical data sheet should be strictly followed.
- never use infrared curing. Air drying or forced oven drying also have different influences on the degree of gloss.

Hyundai offers a matte finish for the 2013 Veloster Turbo. An 11-page owner's manual accompanies the matte finish option, which provides tips on caring for the finish. Among the rules from Hyundai:

- Use only products designated for matte finishes.
- Do not use any product that is mildly abrasive, such as compounds or glazes.
- Do not use terrycloth, cloth, or paper towels. Do not rub the finish vigorously. This will burnish the paint finish causing a permanent shiny spot. Shiny spots cannot be removed.
- Do not use commercial car washes.
- Use microfiber cleaning cloths with alcohol-based window cleaner for basic surface cleanup.

Notes

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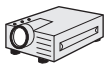
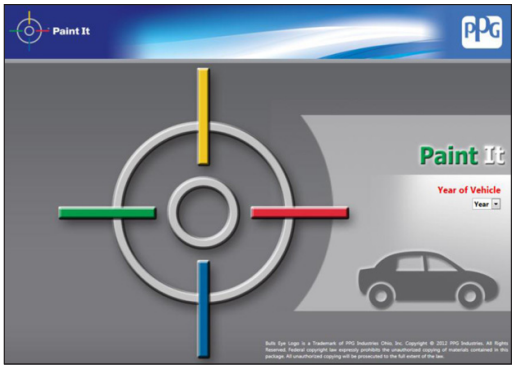
Topic C. New Equipment, Repair Procedures (cont'd)



C-3

PPG Launches "Paint It"



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Refinishers may find the new PPG "Paint It" website helpful. PPG has identified it as a new approach to color identification and selection. Paint It:

- is a free online color identification tool.
- can be found at www.ppgpaintit.com.
- provides a simple feature to identify vehicle colors by model year, manufacturer, model, color family, finish effect, or usage.

Notes

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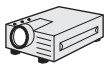
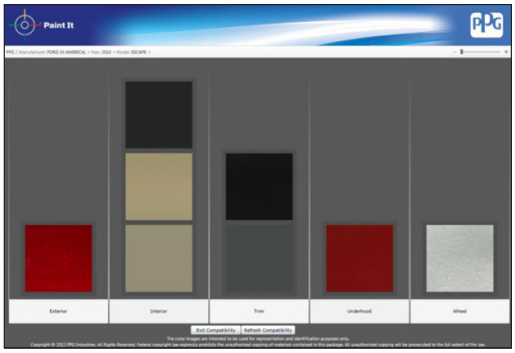
Topic C. New Equipment, Repair Procedures (cont'd)



C-4

PPG Launches "Paint It" (cont'd)



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The Paint It website not only identifies exterior colors. The site also identifies interior, trim, underhood, and wheel colors, which are sometimes hard to identify.

Notes

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Topic C. New Equipment, Repair Procedures (cont'd)

C-5

Stapling Plastic

A relatively new tool to assist with repairing plastic is available. This tool:

- is a hot stapler.
- is used with other repair methods, either adhesive or welding.
- adds a cross reinforcement on cracks or tears on the backside, to hold the pieces together and in alignment.
- can only be used on thermoplastics, not thermoset. Thermoplastics include polypropylene (PP) and thermoplastic polyolefin (TPO), which are common bumper cover materials.
- inserts the heated staple into the plastic, so adhesive or welding repairs can be done without having to hold the two pieces in alignment.

Notes

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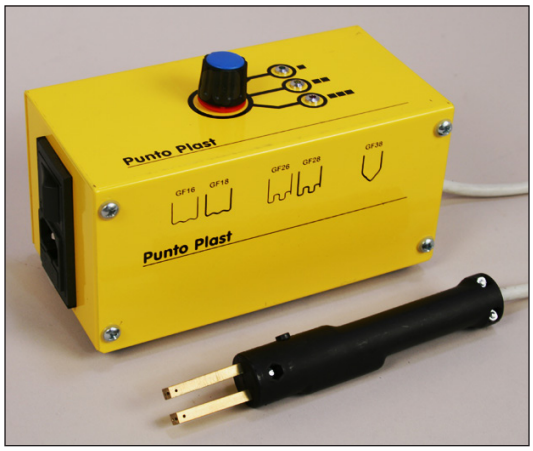
Topic C. New Equipment, Repair Procedures (cont'd)

C-6

Stapling Plastic (cont'd)



The plastic stapling tool:

- consists of a wand and heating unit. The staples are the only consumable.
- may have three heat settings.
- is available from at least three manufacturers: Urethane Supply Company, Chassis Liner Supply, and DentFix.

Notes

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Topic C. New Equipment, Repair Procedures (cont'd)

C-7

Portable 3D Measuring Equipment

Portable equipment that can do three-dimensional measuring for damage appraisals is not new, but the variety of equipment available has increased. All of these types of portable devices make it much easier to make three-dimensional measurements than having to use a dedicated bench. This type of equipment:

- does not require a bench. At least one does not even require the vehicle to be lifted. The Matrix Wand is held above the vehicle to take an image, which is then downloaded. The downloaded image is compared to factory specifications and the differences are shown on a screen.
- includes the Infinity XMS laser system, which uses a scanning device mounted on a tripod that emits laser beams that bounce off targets hung on the vehicle. An immediate readout shows where the vehicle is off of the factory specifications.

Notes

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Topic C. New Equipment, Repair Procedures (cont'd)

- includes the Spanesi system, which is a self-contained unit with a probing wand that is used to touch points on the vehicle. These points are immediately compared to the specifications for the vehicle. If the point is at specification, a chime is heard. If the point is out of specification, a buzzer is heard and the screen shows how far off.

Notes

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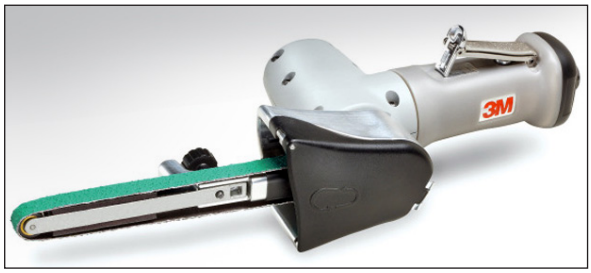
Topic C. New Equipment, Repair Procedures (cont'd)

C-8

3M File Belt Sander



The new 3M file belt sander is being introduced to the collision industry for an efficient way to remove spot welds on ultra-high-strength steel (UHSS). Instead of a special spot weld cutter or drill bit, there is a special abrasive belt that grinds off the spot weld.

The belt uses an exclusive fast cutting, durable abrasive mineral with Polycut™ grinding aid for faster and cooler grinding of UHSS and reduced abrasive loading when grinding aluminum.

The tool can also be used for dressing GMA (MIG) plug welds.

The thin, long belt is designed to access tight areas.

Notes

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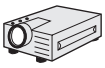
Topic D. Conclusion



D-1

Conclusion

Topics discussed in this module included:

- technologies on newer model vehicles that qualify as industry trends.
- trends resulting from mandates.
- new repair equipment.

Notes

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Vehicle Technology and Trends 2013

Module 2

I-CAR®

Class 0:49

A-1

MODULE 2–NORTH AMERICAN VEHICLE MAKERS

Topic A. Chrysler LLC

Learning Objectives

The learning objectives for this module include describing features on new vehicles and technology from:

- **Chrysler LLC.**
- **Ford Motor Company.**
- **General Motors.**

The learning objectives for this module include describing features on new vehicles and technology from:

- Chrysler LLC.
- Ford Motor Company.
- General Motors.

Notes

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Topic A. Chrysler LLC (cont'd)

A-2v

Video: Tech/Trends Trivia

Notes

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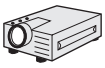
Topic A. Chrysler LLC (cont'd)



A-3

2013 SRT Viper

The Dodge Viper has been redesigned for 2013, and it no longer carries the "Dodge" brand, but "SRT," which stands for "Street and Racing Technology." Highlights of the body include:

- a steel space frame structure.
- a carbon fiber hood, roof, and deck lid.
- aluminum doors, both the frame and skin, as well as aluminum rocker panels, front bumper reinforcement, and front and rear suspension. An aluminum cross brace over the engine compartment can be seen when opening the hood.
- a cast magnesium cowl panel. Chrysler claims this is the largest cast application of magnesium for any vehicle.

Notes

Objectives Worksheet

The Dodge Viper has been redesigned for 2013, and it no longer carries the "Dodge" brand, but "SRT," which stands for "Street and Racing Technology." Highlights of the body include a:

- carbon fiber hood, roof, and deck lid.
- cast magnesium cowl panel. Chrysler claims this is the largest cast application of magnesium for any vehicle.

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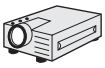
Topic A. Chrysler LLC (cont'd)



A-4v

Video: 2013 Dodge Dart

Notes

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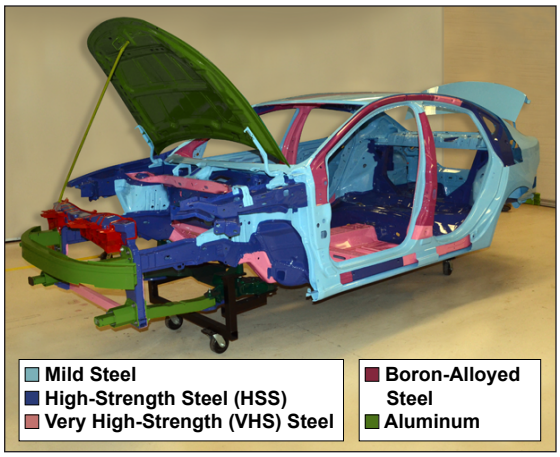
Topic A. Chrysler LLC (cont'd)

A-5

Dodge Dart Construction Features



The first Dodge Dart was released in 1960. The 2013 Dodge Dart is based on the European-only Alfa Romeo Giulietta (joo-lee-ET-ah).

Some construction features on the Dart include:

- very high strength (VHS) steel, or UHSS front floor pan and crossmembers. This means no pulling out the sides to straighten a damaged floor pan. Damage to the floor pan requires replacing the floor pan.
- boron-alloyed steel for the A-pillar, roof rail, and B-pillar reinforcements.
- inner B-pillars just as strong as the floor pan.

Aluminum is used for the hood, bumper reinforcement, and front lower rail crushboxes.

When the vehicle was launched in the spring of 2012, the front lower control arms were steel. In November of 2012, the lower control arms were changed to aluminum. Some steel replacement lower control arms are available, allowing only the damaged steel control arm to be replaced.

Notes

Objectives Worksheet

Some construction features on the 2013 Dodge Dart include very high strength (VHS) steel, or UHSS front floor pan and crossmembers. This means no pulling out the sides to straighten a damaged floor pan. Damage to the floor pan requires replacing the floor pan.

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Topic A. Chrysler LLC (cont'd)

Eventually, however, all the replacement parts will be aluminum. If replacing a damaged steel front lower control arm, and the replacement is only available as an aluminum part, the control arms must be replaced as a pair so that both control arms are made from the same type of metal. Do not use a steel and aluminum control arm on the same vehicle.

Notes

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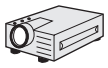
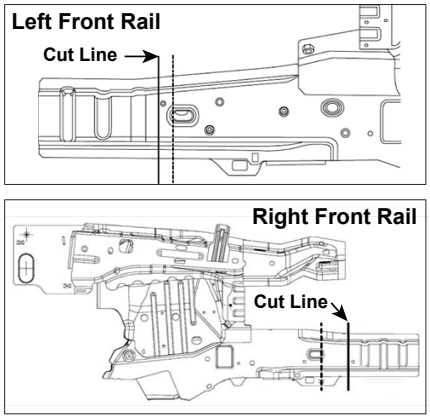
Topic A. Chrysler LLC (cont'd)



A-6

Sectioning Dodge Dart Front Lower Rails



Courtesy of Chrysler LLC

Repair procedures on the front lower rails of the Dodge Dart include:

- sectioning procedures behind the convoluted areas. Exact locations are in the body repair manual on the Chrysler website.
- different cut line locations on the left lower rail vs. the right lower rail.
- butt joints with a 13 mm (½") backing.

Notes

Objectives Worksheet

Sectioning procedures on the front of the Dodge Dart include:

- front lower rail sectioning procedures behind the convolutions.
- different cut line locations on the left lower rail vs. the right lower rail.
- butt joints with a 13 mm (½") backing.

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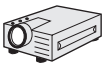
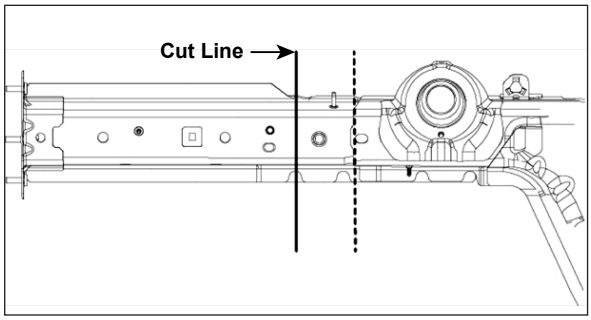
Topic A. Chrysler LLC (cont'd)



A-7

Dodge Dart Rear Rails



Courtesy of Chrysler LLC

Repair procedures on the rear rails of the Dodge Dart include:

- a sectioning procedure that requires cutting through the outer rail only. There is an inner reinforcement directly beneath. The cut line is in the same location on the right and left side. The exact cutting location is listed in the body repair manual on the Chrysler website.
- a butt joint with backing weld.
- using the reinforcement as a backing for the butt joint.

Notes

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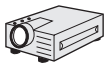
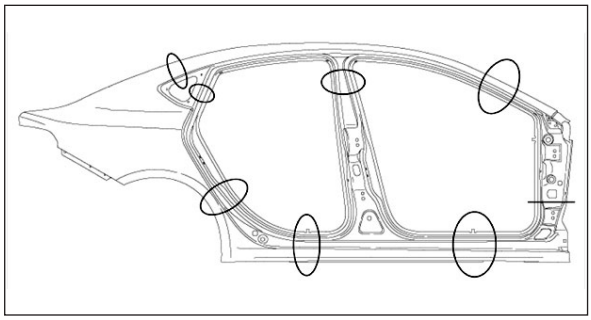
Topic A. Chrysler LLC (cont'd)



A-8

Dodge Dart Side Aperture Repairs



Courtesy of Chrysler LLC

There are sectioning procedures on several locations on the outer side aperture for the Dodge Dart, including a specific location in the lower A-pillar and zones at several other locations based on the damage. A butt joint with a 13 mm backing is recommended on all the locations.

Note that the A- and B-pillar reinforcements are boron-alloyed steel, and cannot be sectioned. If the damage extends into these parts, replacement is the only option.

Notes

Objectives Worksheet

There are sectioning procedures on several locations on the Dodge Dart, including the outer side aperture.

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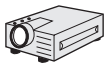
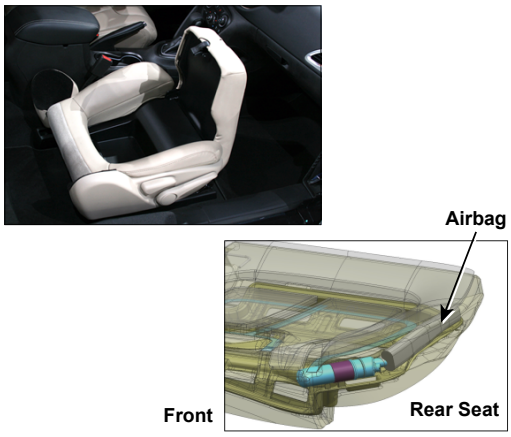
Topic A. Chrysler LLC (cont'd)



A-9

Dodge Dart Industry Firsts



Courtesy of Chrysler LLC

There are some industry firsts in the Dodge Dart interior. These include a:

- seat storage system using the front passenger seat. With this optional system, the front passenger seat cushion opens up from the rear so it is facing forward. A storage area is revealed with the seat cushion serving as a backing so items will not spill forward when the vehicle brakes.
- wireless phone charger pad option that fits in the center console. The pad may be sensitive to cleaning chemicals, so look for it when detailing the interior.
- rear seat airbag that deploys from the bottom seat cushion, instead of the seat back or door panel. The airbag is designed to protect the occupant's hip. When it deploys, the deployed module, the seat cushion, and seat cover require replacement. Child safety seats were taken into consideration in the design of the rear seat airbags. The airbags deploy without harming a child in a safety seat.

Notes

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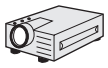
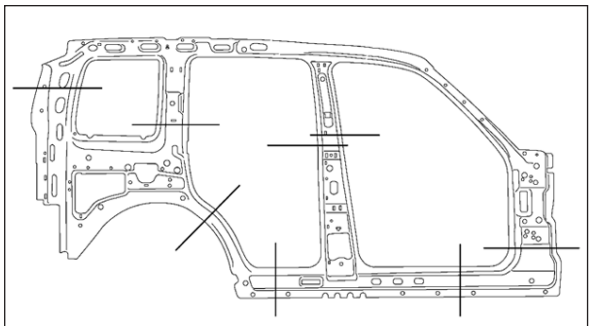
Topic A. Chrysler LLC (cont'd)



A-10

New Sectioning Procedures



2002–2007 Jeep Liberty Inner Side Panel

Courtesy of Chrysler LLC

Chrysler has published new sectioning procedures for the Jeep Liberty and Dodge Nitro. Previously, there was only a front rail procedure on these two vehicles. The procedures are available on the www.TechAuthority.com pay website.

Some locations are not specific, so there are general recommendations to not section through holes, formations, and at least 25 mm from laser weld locations.

These procedures include, for example, several sectioning locations on the 2002–2007 Jeep Liberty inner side panel. Only the B-pillar locations are specific. The remaining locations are somewhat flexible based on the damage. Butt joints with backing are recommended at the joint locations.

Notes

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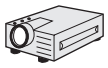
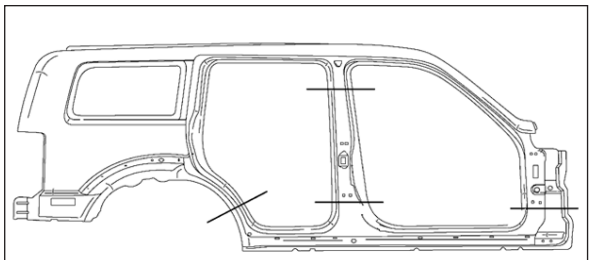
Topic A. Chrysler LLC (cont'd)



A-11

New Sectioning Procedures (cont'd)



Dodge Nitro 2007 And Newer

Courtesy of Chrysler LLC

The procedures also include locations to section the outer B-pillar on the 2007 and newer Dodge Nitro. This includes a location down from the roof rail on the outer B-pillar when the B-pillar reinforcement or inner side panel is being partially replaced. It also includes locations on the A- and B-pillar bottoms and in the dogleg area when only the rocker panel is being replaced.

Notes

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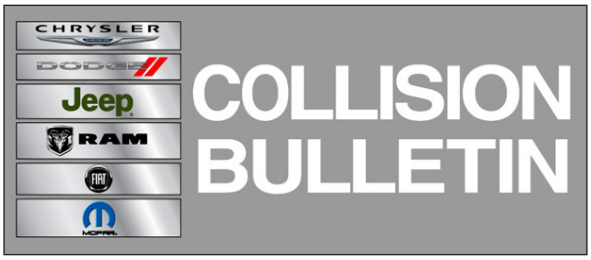
Topic A. Chrysler LLC (cont'd)

A-12

Chrysler Collision Repair Bulletins



Chrysler has started publishing bulletins specific to collision repair. These bulletins are:

- issued whenever necessary. There is no set schedule.
- available on the www.TechAuthority.com pay website. On the Service Bulletins tab, go to Group 31.

CHRYSLER COLLISION REPAIR BULLETINS

Notes

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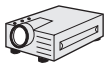
Topic A. Chrysler LLC (cont'd)



A-13

Replacement Vehicle Information Labels

MFD BY CHRYSLER GROUP LLC
DATE OF MFR: 9-10
GAWR: 3848 KG 6700 LB
GAWR FRONT: 1678 KG 3700 LB WITH P275/60R20 TIRES
280kPa RIMS AT 240 kPa (35 PSI) COLD
GAWR REAR: 1770 KG 3900 LB WITH P275/60R20 TIRES
280kPa RIMS AT 240 kPa (35 PSI) COLD
THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S.A. FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.
VIN: 1D7RB1GT4BS000000 TYPE: TRUCK MFR:891007 115AA
VEHICLE MADE IN U.S.A. PAINT: PAT TRIM: HAVB
TIRE AND LOADING INFORMATION
SEATING CAPACITY - TOTAL 7 FRONT 2 REAR 5
THE COMBINED WEIGHT OF OCCUPANTS AND CARGO SHOULD NEVER EXCEED 521 KG OR 1150 LB
TIRE
FRONT
REAR
SPARE
ORIGINAL TIRE SIZE
225/65R16
225/65R16
T145/90D16
COLD TIRE INFLATION PRESSURE
250 kPa / 36 PSI
250 kPa / 36 PSI
420 kPa, 60 PSI
SEE OWNERS MANUAL FOR ADDITIONAL INFORMATION
BR677946

One of the Chrysler collision repair bulletins states that replacement vehicle information labels are now available. These labels are:

- authentic replacements for the Safety Certification and Tire Pressure labels. These two labels are only available through ECS Automotive Concepts (www.ecsvin.com).
- for the doorjamb and underhood locations. The underhood labels are available from Chrysler dealers.
- available for 1991 and newer vehicles.

Notes

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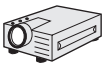
Topic B. Ford Motor Company



B-1v

Video: Tech/Trends Trivia

Notes

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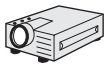
Topic B. Ford Motor Company (cont'd)



B-2

2013 Ford Fusion Family

As of the 2013 model year, there is a family of Ford Fusions available, including:

- a conventional sedan.
- a hybrid electric with a lithium-ion battery pack.
- the plug-in hybrid electric Energi, also with a lithium-ion battery pack.

Notes

Objectives Worksheet

As of the 2013 model year, there is a family of Ford Fusions available, including:

- a conventional sedan.
- a hybrid electric with a lithium-ion battery pack.
- the plug-in hybrid electric Energi, also with a lithium-ion battery pack.

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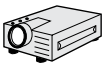
Topic B. Ford Motor Company (cont'd)



B-3

Ford On Electric Vehicle Handling

Ford has issued a guide for towing companies and others who handle severely damaged vehicles with lithium-ion batteries. The recommendations are consistent with NHTSA guidelines for electric vehicles. The recommendations include:

- being aware of the potential of a delayed fire with damaged lithium-ion batteries.
- explaining that vapors emitted from a damaged lithium-ion battery are potentially toxic and flammable.
- a precaution to store severely damaged vehicles more than 50 feet from any structures or other vehicles.

The guidance is included in the Focus Electric Emergency Response Guide, available free at the www.motorcraftservice.com website. At the website, select "Quick Guides" for a list of guides available.

FORD ON ELECTRIC VEHICLE HANDLING

Notes

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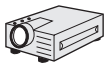
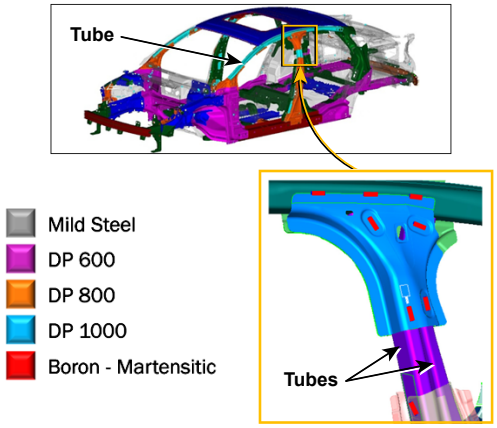
Topic B. Ford Motor Company (cont'd)



B-4

2013 Ford Fusion Tubular Structure



Great Designs in Steel 2012 Presentation

The 2013 Ford Fusion sedan structure features:

- dual-phase (DP) 1,000 MPa hydroformed tubes. There is a one-piece tube that makes up the roof rail from the base of the A-pillars to the C-pillars.
- twin tubes side by side in each B-pillar.
- boron-alloyed steel in the B-pillar reinforcements, rocker panel reinforcements, and the front and rear bumper reinforcements.

Notes

Objectives Worksheet

The 2013 Ford Fusion sedan structure features:

- dual-phase (DP) 1,000 MPa hydroformed tubes. There is a one-piece tube that makes up the roof rail from the base of the A-pillars to the C-pillars.
- twin tubes side by side in each B-pillar.

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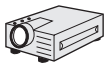
Topic B. Ford Motor Company (cont'd)



B-5

2013 Ford Escape

The 2013 Ford Escape:

- has four times as much HSS and UHSS as the previous model. One-third of the steel is advanced HSS and UHSS. The top of the A- and B-pillar reinforcements are boron-alloyed steel.
- has sectioning procedures for the exterior side aperture only.
- features side curtain airbags that stay inflated for six seconds, part of what NHTSA believes may be necessary for the airbags to be ejection mitigation devices.

Starting with the 2013 models, Ford has enhanced their repair website at www.motorcraftservice.com with improved color graphics. Material identification, including steel by specific type, is color-coded.

Notes

Objectives Worksheet

The 2013 Escape has four times as much HSS and UHSS as the previous model. One-third of the steel is advanced HSS and UHSS. The top of the A-pillar and B-pillar reinforcements are boron-alloyed steel. There are sectioning procedures for the exterior side aperture only. The Escape features side curtain airbags that stay inflated for six seconds, part of what NHTSA believes may be necessary for the airbags to be ejection mitigation devices.

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Topic B. Ford Motor Company (cont'd)

B-6

More Rear Inflatable Seat Belts

The 2013 Ford Flex and all Lincoln vehicles have a rear inflatable seat belt, a feature that began as an option on the 2011 Ford Explorer. The plan is to eventually include this feature across the entire Ford/Lincoln line.

The shoulder strap in both rear seats inflates in a frontal impact. If the seat belt is not buckled, it will not inflate. There is a cold compressed gas canister beneath each seat that inflates the airbag in the shoulder belt webbing. Once deployed, the entire seat belt assembly and gas canister must be replaced. Deployment is evident by the shoulder strap seams ripped open. The inflatable seat belts are compatible with infant and child safety car and booster seats.

Mercedes-Benz, which featured an inflatable rear seat belt on the 2009 Experimental Safety Vehicle, plans to introduce rear inflatable seat belts in one of their luxury-class vehicles.

Notes

Objectives Worksheet

The 2013 Ford Flex and all Lincoln vehicles have a rear inflatable seat belt, a feature that began as an option on the 2011 Ford Explorer. The shoulder strap in both rear seats inflates in a frontal impact. If the seat belt is not buckled, it will not inflate.

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Topic B. Ford Motor Company (cont'd)

B-7

2013 Ford C-MAX

The 2013 Ford C-MAX and C-MAX Energi:

- are the first-ever dedicated hybrid vehicles from Ford.
- are a hybrid electric called the C-MAX, and a plug-in hybrid electric called the C-MAX Energi.
- use a lithium-ion battery pack.

Notes

Objectives Worksheet

The 2013 Ford C-MAX and C-MAX Energi are the first-ever dedicated hybrid vehicles from Ford.

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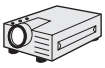
Topic C. General Motors Corporation



C-1v

Video: Tech/Trends Trivia

Notes

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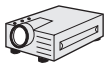
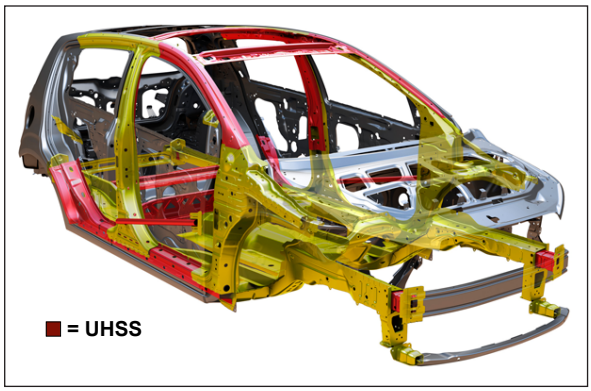
Topic C. General Motors Corporation (cont'd)



C-2

2013 Chevrolet Sonic



© General Motors

There is an extensive use of UHSS on the 2013 Chevrolet Sonic. This includes the roof header panel, center roof crossmember, inner B-pillar, inner rocker panel, and rocker panel reinforcement. These parts are only replaced.

There are several sectioning procedures on the non-UHSS parts. This includes procedures for the outer A- and B-pillar and rocker panel, inner and outer quarter panel, and rear rail.

The Sonic is made in Korea, where the service information along with the body repair information is written. GM in the U.S. does not own the service information, and they cannot change it. Besides the Sonic, the Chevrolet Spark and the Buick Encore are also made in Korea.

Notes

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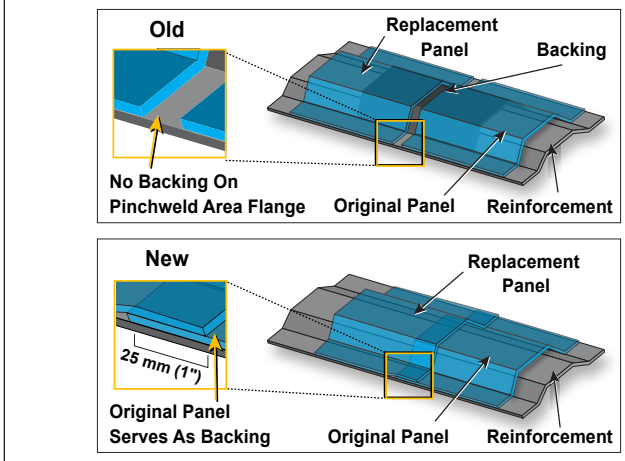
Topic C. General Motors Corporation (cont'd)

C-3



The outer sectioning joints on the Sonic represent a new trend for GM, lap joints instead of butt joints with a backing. The issue with a butt joint is that there is no protection to the UHSS reinforcement on the flange areas, which allows too much heat.

With a lap joint, the overlapped area serves as a backing along the entire joint, even on the flanges. GM is recommending a 25 mm overlap.

Notes

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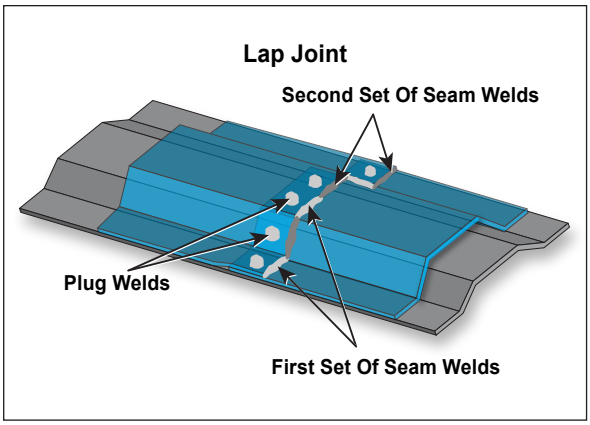
Topic C. General Motors Corporation (cont'd)

C-4

25 mm Lap Joint (cont'd)



The lap joint on outer panels:

- is recommended to be made in one-inch weld intervals, or the skip method, to also avoid excessive heat.
- is being recommended on many new uniside repairs, but especially where the outer panel is backed by a UHSS reinforcement.
- may or may not include plug welds, in addition to the fillet weld. Pay attention to the vehicle-specific recommendations in the service information.

Notes

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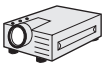
Topic C. General Motors Corporation (cont'd)



C-5v

Video: 2013 Cadillac ATS

This video shows some of the features on the 2013 Cadillac ATS of interest to the collision repair industry.

Notes

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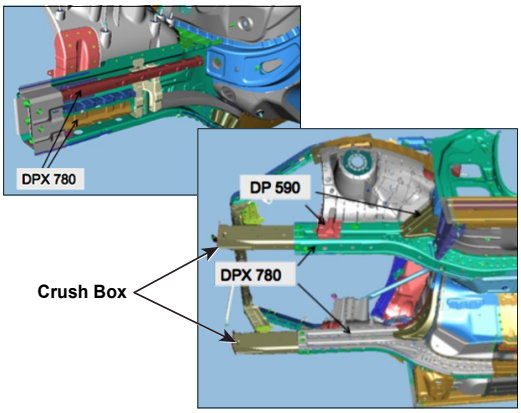
Topic C. General Motors Corporation (cont'd)

C-6

Front Lower Rails On Cadillac ATS



Courtesy of General Motors Corporation

The 2013 Cadillac ATS has more UHSS than any vehicle in GM's history. UHSS parts include the front lower rails. The front lower rails on the Cadillac ATS:

- have a bolt-on aluminum crush box in the front. Any damage rearward of the crush boxes requires complete rail replacement.
- have dual-phase (DP) 780 MPa steel inners and outers that start directly behind the crush boxes. DP 780 steel is considered UHSS. GM uses "DPX" to identify dual-phase steel over 780 MPa.
- have DP 780 MPa steel reinforcements.
- can only be replaced as a whole. There is no partial replacement.

There is a sectioning procedure for the rear rails.

Notes

Objectives Worksheet

The 2013 Cadillac ATS has more UHSS than any vehicle in GM's history. UHSS parts include the front lower rails. The front lower rails on the Cadillac ATS can only be replaced as a whole. There is no partial replacement.

There is a sectioning procedure for the rear rails.

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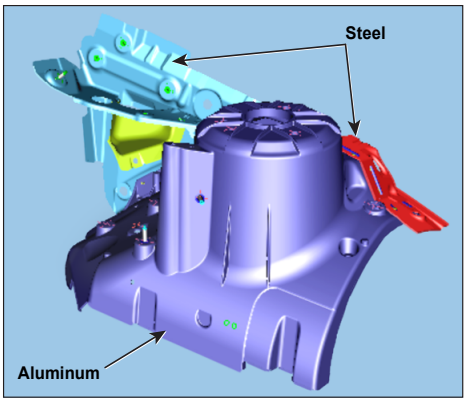
Topic C. General Motors Corporation (cont'd)

C-7

Aluminum Wheelhouse On Cadillac ATS



Courtesy of General Motors Corporation

There is an aluminum front wheelhouse on the Cadillac ATS that is bonded and riveted to steel brackets attaching it to the rest of the apron.

The service part is an assembly that is bonded and riveted to the steel upper and lower rails. This is also the way the part is installed during production.

Notes

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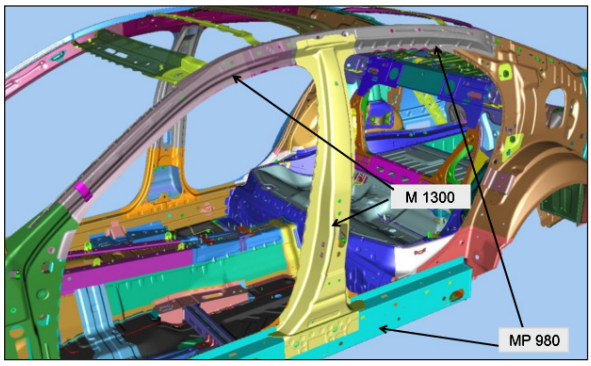
Topic C. General Motors Corporation (cont'd)

C-8

Side Structure On Cadillac ATS



Courtesy of General Motors Corporation

The side structure on the Cadillac ATS includes:

- a martensitic (M) roof rail that is 1,300 MPa steel, the highest tensile-strength steel used by GM to date. M 1,300 is also used for the B-pillar reinforcement. The rocker panel reinforcement is multi-phase (MP) 980 MPa steel. The B-pillar reinforcement is replaced in its entirety by cutting open a window in the top of the outer B-pillar. There is a warning in the service information to not cut into the UHSS roof rail when doing that procedure.
- DP 780 steel baffles in the rocker panel.
- a UHSS inner B-pillar. The top three-quarters is MP 980 MPa steel. The bottom fourth, often made of mild steel on other vehicles, is DP 780 MPa steel.

Note that the structure on the Cadillac XTS is not like the ATS. The XTS structure is similar to the 2013 Buick LaCrosse.

Notes

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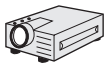
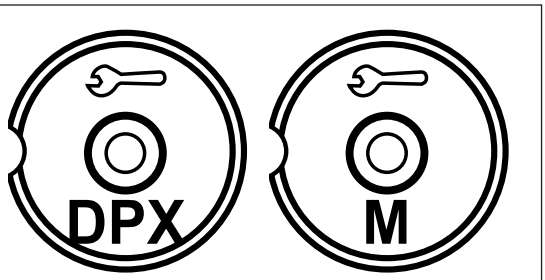
Topic C. General Motors Corporation (cont'd)



C-9

UHSS Stamp Intentions



Dual Phase > 780	DPX
Multi-Phase	MP
Martensitic	M
Boron/Press-Hardened	B
Trip	TR

GM intends to stamp steel parts that are 780 MPa and higher. In other words, UHSS parts will now have an embossed stamp for easier identification. The stamping begins with the 2013 Cadillac ATS. The intention is to stamp all UHSS production and service parts. For lengthy parts, such as a rocker panel, there may be multiple stamps along the length.

The stamps are to include "DPX" on dual-phase steel over 780 MPa, "MP" on multi-phase steel, "M" on martensitic steel, "B" on boron or press-hardened steel, and "TR" on TRIP steel.

Notes

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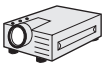
Topic C. General Motors Corporation (cont'd)



C-10v

Video: E-Assist "Hybrid"

This video shows some of the features of the GM E-assist models.

Notes

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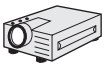
Topic C. General Motors Corporation (cont'd)



C-11v

Video: Tech/Trends Trivia

Notes

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Topic C. General Motors Corporation (cont'd)

C-12

Structural Changes To Chevrolet Volt

© General Motors

GM made some structural changes to the Chevrolet Volt in 2012 after an incident at a government testing facility. The Volt caught fire three weeks after it had been damaged in a crash test. The cause of the fire was traced to a coolant leak, caused by the impact, that later led the battery to overheat and self-ignite.

To help prevent further fire incidents, GM added a:

- safety cage around the battery.
- tamper-resistant bracket to the coolant reservoir to help prevent coolant overfill.
- sensor to monitor coolant levels.

Four new crash tests were done after the changes, and no further fire incidents were reported.

Notes

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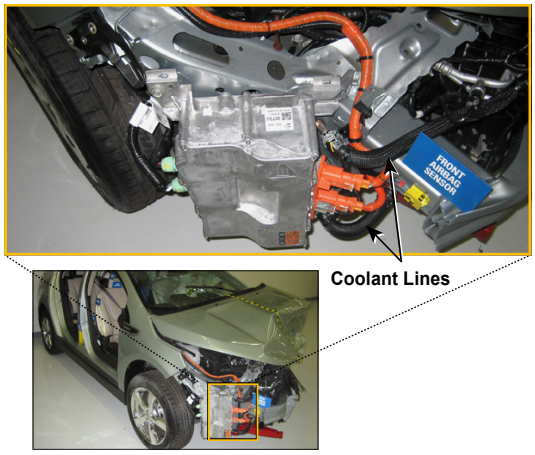
Topic C. General Motors Corporation (cont'd)

C-13

AC Charger On Chevrolet Volt



The Chevrolet Volt has been on the road in some states since 2011 and is getting damaged in collisions. One item that has been getting some attention is the exposure of the high voltage charging system that recharges the high voltage battery. The charger converts household AC into DC voltage to charge the onboard battery.

The charger is liquid-cooled, so it has two coolant lines going in and out of the unit.

Notes

Objectives Worksheet

The Chevrolet Volt has been on the road in some states since 2011 and is getting damaged in collisions. One item that has been getting some attention is the exposure of the high voltage charging system that recharges the high voltage battery.

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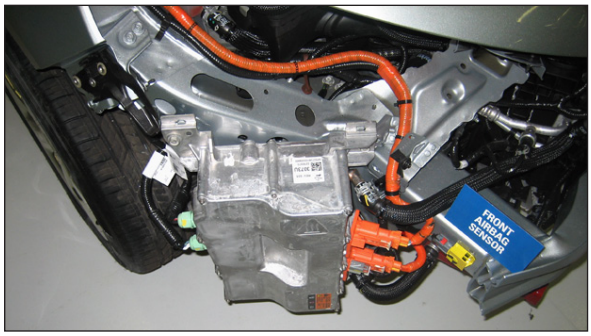
Topic C. General Motors Corporation (cont'd)

C-14

Location Of AC Charger On Chevrolet Volt



The high voltage charger on the Chevrolet Volt is located behind the passenger headlamp assembly and bumper fascia on the right side. The bumper reinforcement stops short of the charger, so it could be vulnerable in a collision.

After a front collision, inspect this unit for:

- structure damage.
- leaking coolant lines.
- damaged electrical plugs.

Notes

Objectives Worksheet

The high voltage charger on the Chevrolet Volt is located behind the passenger headlamp assembly and bumper fascia on the right side. The bumper reinforcement stops short of the charger, so it could be vulnerable in a collision.

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Topic C. General Motors Corporation (cont'd)

C-15

New Refrigerant Plans For Cadillac

The new refrigerant replacement of choice, R-1234yf, is installed on the 2013 Cadillac ATS and XTS, first in the U.S.

R-1234yf is so far in short supply. Currently, most of the refrigerant is being shipped to Europe, where a European Community regulation requires it for new vehicle platforms built after January 2011. R-1234yf has been approved by the Environmental Protection Agency (EPA), but it is not a requirement for new vehicle platforms built in North America. One incentive for U.S. vehicle makers to make the changeover, however, is that they receive credits toward their CAFÉ requirements.

Notes

Objectives Worksheet

The new refrigerant replacement of choice, R-1234yf, is installed on the 2013 Cadillac ATS and XTS, first in the U.S.

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Topic C. General Motors Corporation (cont'd)

R-1234yf cannot be mixed with R-134a. Retrofitting is not possible, so the refrigerant must be installed during the original build. But despite the CAFÉ incentive, there is not a rush for changeovers due to:

- high cost of the refrigerant, which is ten to 12-times the price of R-134a.
- inefficiency. R-1234yf is less efficient than R-134a.
- the refrigerant being slightly flammable, so more safety systems must be installed.

New recycling/recharging equipment is necessary to service these systems, but independent facilities should not have to worry about purchasing new equipment for several years.

Notes

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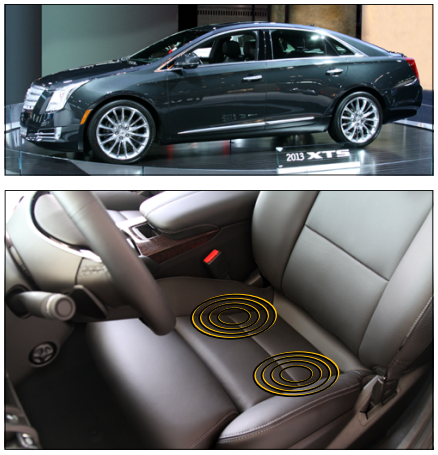
Topic C. General Motors Corporation (cont'd)

C-16

Vibrating Seat On The Cadillac XTS



While some vehicles have a vibrating steering wheel to alert the driver when the vehicle is drifting out of its lane, GM has introduced a vibrating seat to serve the same purpose. The Cadillac "Safety Alert Seat" feature, available on the 2013 XTS:

- alerts the driver of a possible collision, such as drifting out of a lane or if the vehicle is moving toward nearby objects when parking.
- vibrates either the left or right side of the driver seat cushion, depending on the side where an imminent collision is about to occur when driving or parking.
- vibrates both sides of the seat when there are threats from the front or the rear.

The system uses camera sensors to view lane markers. The vibration motors are subtle, similar to the muted ring of a cell phone. There are no recalibrations or resetting procedures when the seat is removed and reinstalled.

Notes

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Topic C. General Motors Corporation (cont'd)

C-17

First Center Airbag

A first for GM is the center airbag on the 2013 Lambda platform, which includes the GMC Acadia, Chevrolet Traverse, and Buick Enclave. The center airbag:

- deploys from the inboard side of the driver seat.
- is designed to protect the driver and front passenger in an impact on the far side, in other words, protect the driver in a right-side collision and the passenger in a left-side collision. The center airbag, combined with the regular side airbag, sandwiches the occupant in a side collision.
- is expected to be spread to other GM vehicles in future model years.

Notes

Objectives Worksheet

A first for GM is the center airbag on the 2013 Lambda platform, which includes the GMC Acadia, Chevrolet Traverse, and Buick Enclave. The center airbag deploys from the inboard side of the driver seat.

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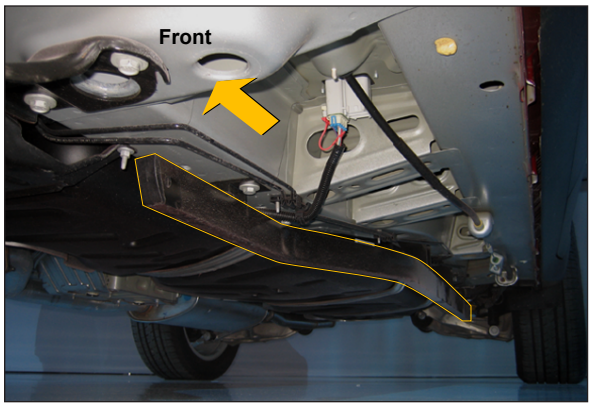
Topic C. General Motors Corporation (cont'd)

C-18

Fuel Tank Shield And Skid



Also on the 2013 GM Lambda platform, including the GMC Acadia, Chevrolet Traverse, and Buick Enclave, there is a rail-like member on the underbody that is formed along the fuel tank. This member is:

- both a visual shield and a protective skid plate to prevent the fuel tank from skidding along the ground in a collision situation.
- only on the driver side.
- not a jacking point or lift location, as it is not structural.

Notes

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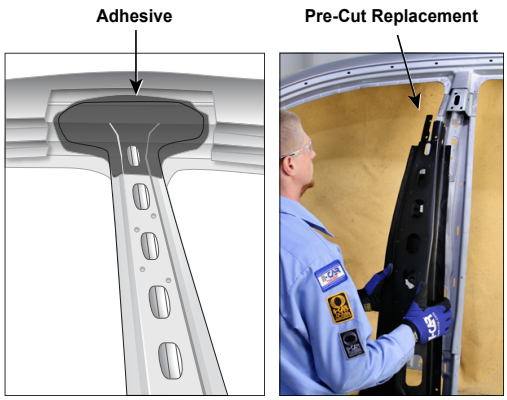
Topic C. General Motors Corporation (cont'd)

C-19

Lambda Platform B-Pillar Structural Adhesive



Also on the GM Lambda platform, including the GMC Acadia, Chevrolet Traverse, and Buick Enclave, structural adhesive has been added between the outer B-pillar and reinforcement at the top of the B-pillar. This adhesive:

- was added in 2011 to pass the government 2012 roof crush test.
- results in GM requiring the complete reinforcement assembly be replaced at factory seams. Previous to 2011, the reinforcement could be cut at the top. The replacement reinforcement came pre-cut to sleeve under the existing part. Be sure to have the correct part when ordering.
- when replaced, can only be ordered from one supplier, L&L Products. The repair information provides contact information for the adhesive kit.

There are no plans at this time to add structural adhesive to B-pillars on other GM models.

Notes

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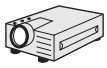
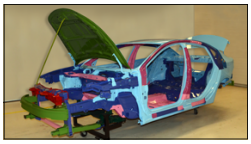
Topic D. Conclusion



D-1

Conclusion



Topics covered in this module included features on new technology and vehicles from:

- Chrysler LLC.
- Ford Motor Company.
- General Motors.

Notes

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Vehicle Technology and Trends 2013

Module 3

I-CAR®

Class 0:31

A-1

MODULE 3–ASIAN VEHICLE MAKERS

Topic A. Honda/Acura

Learning Objectives

The learning objectives for this module include describing features on new vehicles and technology from:

- **Honda/Acura.**
- **Infiniti.**
- **Mazda.**
- **Subaru.**
- **Toyota/Lexus/Scion.**

The learning objectives for this module include describing features on new vehicles and technology from:

- Honda/Acura.
- Infiniti.
- Mazda.
- Subaru.
- Toyota/Lexus/Scion.

Notes

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Topic A. Honda/Acura (cont'd)

A-2v

Video: Tech/Trends Trivia

Notes

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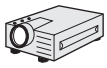
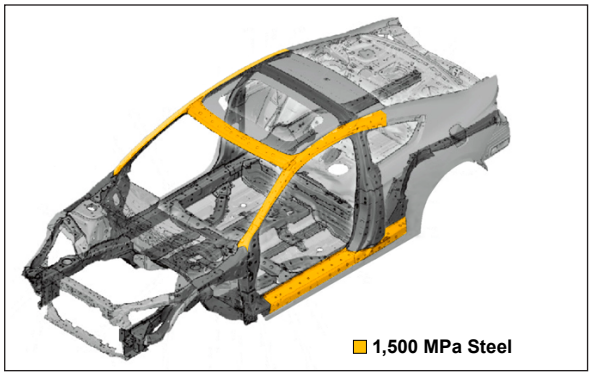
Topic A. Honda/Acura (cont'd)



A-3

2013 Honda Accord



Courtesy of American Honda Motor Co., Inc.

The 2013 Honda Accord redesign marks the 9th generation of this model. The Accord debuted in 1976.

The 2013 Accord uses the most high-strength steel in the model's history, including strengths of 780, 980 and 1,500 MPa, none of which have ever been used on an Accord. 1,500 MPa steel is used for the upper inner A-pillar and the rocker panel reinforcement on both the sedan and the coupe. On the sedan, there is also 1,500 MPa steel used for the upper B-pillar reinforcement. On the coupe, there is also 1,500 MPa steel used for the front roof crossmember and roof rail reinforcement.

With regards to repairs, Honda specifies spot welds be replaced with repair spot welds, one for one. Spot welders must be capable of generating 9,000 amps. Where spot welding cannot be done, plug welds using MIG brazing is required. Honda states to NOT replace spot welds with GMA (MIG) plug welds or do any GMA (MIG) welding on the 1,500 MPa steel. The MIG brazed plug welds directly on the 1,500 MPa reinforcements requires drilling

Notes

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Topic A. Honda/Acura (cont'd)

two 8 mm holes and filling the holes by MIG brazing. Attaching exterior panels to the 1,500 MPa reinforcements requires drilling one 8 mm hole. The locations where spot welders cannot access and where MIG brazing is required are identified in the Honda body repair information.

Notes

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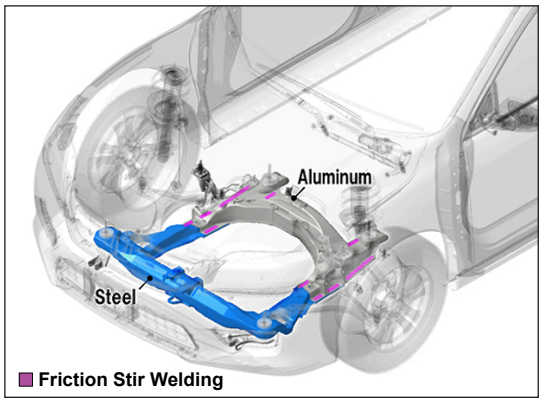
Topic A. Honda/Acura (cont'd)

A-4

2013 Honda Accord (cont'd)



Courtesy of American Honda Motor Co., Inc.

An industry first for the 2013 Accord is a combination of aluminum and steel for the front subframe (engine cradle). The main portion of the subframe is steel. Aluminum is lapped over the steel in the rear and there is an aluminum rear crossmember. Where the steel and aluminum are lapped, they are joined using friction stir welding. Unlike spot welding, friction stir welding is a factory-only process that uses pressure and friction with a spinning pin to create heat. The use of galvanized steel prevents corrosion between the dissimilar metals. Honda says the aluminum and steel subframe not only reduces weight, compared to an all-steel subframe, but increases rigidity of the suspension mounting points. Honda plans to expand the aluminum and steel subframe to other models in the future.

Honda is planning a plug-in hybrid version of the Accord, and a conventional two-mode hybrid. One difference with the body construction, at least for the plug-in hybrid, is a completely aluminum subframe instead of the aluminum and steel combination.

Notes

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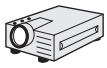
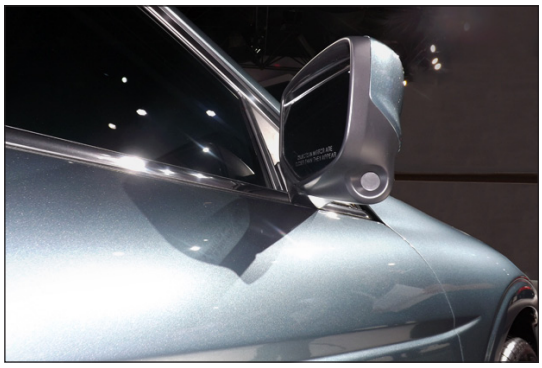
Topic A. Honda/Acura (cont'd)



A-5

Honda Commits To Cameras



Honda has made a commitment to cameras for 2013. Over 94% of the 2013 Honda lineup is equipped with standard rearview cameras, 100% of the truck lineup.

The 2013 Accord and Crosstour debut three other camera-based systems as options. One is Honda's a forward crash warning feature. With this system, a camera is mounted behind the windshield to warn drivers of a potential collision in front.

Another is a lane departure warning system, which uses the same camera to alert the driver if the vehicle is moving out of its lane.

The third system is a lane-watch display feature. A camera mounted on the passenger mirror provides an enhanced view of the road on the right side, normally not seen by the driver.

None of these systems are linked to the steering or braking systems.

Notes

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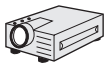
Topic A. Honda/Acura (cont'd)



A-6

Honda Fit EV Slow Rollout

The pure-electric Honda Fit EV is said to get 123 miles on a single charge.

A feature of the Honda Fit EV is that it can send a charging update to a smart phone.

Honda plans a slow rollout of the Fit EV that started with leasing only to the California and Oregon markets. In 2013, select East Coast markets were added.

Notes

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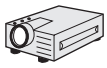
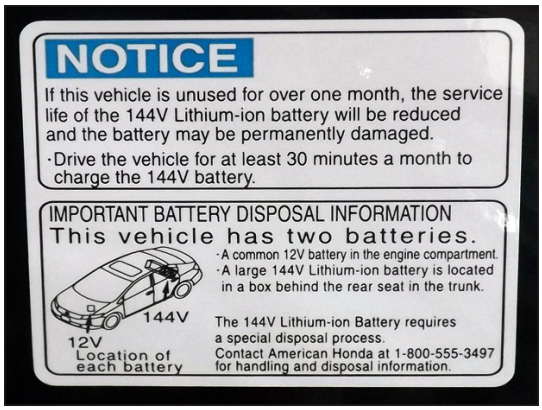
Topic A. Honda/Acura (cont'd)



A-7

Acura Notice For Lithium-Ion Batteries


NOTICE
If this vehicle is unused for over one month, the service life of the 144V Lithium-ion battery will be reduced and the battery may be permanently damaged.
·Drive the vehicle for at least 30 minutes a month to charge the 144V battery.
IMPORTANT BATTERY DISPOSAL INFORMATION
This vehicle has two batteries.
·A common 12V battery in the engine compartment.
·A large 144V Lithium-ion battery is located in a box behind the rear seat in the trunk.
144V
12V
Location of each battery
The 144V Lithium-ion Battery requires a special disposal process.
Contact American Honda at 1-800-555-3497 for handling and disposal information.

An underhood sticker on the Acura ILX Hybrid indicates that lithium-ion batteries have a discharge problem if they sit too long. The notice states that:

- there may be permanent damage to the battery if unused for one month.
- the vehicle should be driven for at least 30 minutes per month to recharge the high voltage battery.

This is similar to warnings for nickel-metal hydride (NiMH) batteries, showing that the battery systems are similar in some respects.

Notes

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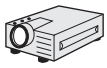
Topic A. Honda/Acura (cont'd)



A-8

Second Generation Acura NSX

There is a new generation of the Acura NSX on the horizon. Acura stopped production on the first generation sports car in 2005. The second generation NSX:

- will be a gasoline/electric hybrid.
- will have electric motors at each front wheel.
- is scheduled for a 2015 release.

The original NSX, released in 1990, was the first aluminum-intensive vehicle. The 2015 NSX is being built in Ohio.

Notes

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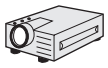
Topic B. Infiniti/Nissan



B-1v

Video: Technology On Infiniti JX35

This video shows some of the special features on the 2013 Infiniti JX35.

The JX35 shares its unibody platform with the Nissan Pathfinder, which went from full-frame to unibody for 2013.

Notes

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Topic C. Mazda

C-1

Bumper Cover Material On Mazda CX-5

Mazda has made progress on a new bumper cover material featured on the 2013 CX-5. This bumper cover material:

- combines polypropylene (PP) with rubber. It has the same rigidity as standard PP, but with less weight. This material is exclusive to the CX-5 for 2013, but it will be used on future Mazda models, since there is a weight reduction.
- repairs and refinishes the same as standard PP.

The Mazda CX-5 also has 1,800 MPa front and rear bumper reinforcements, which may be the strongest steel made to date. Reports say the next generation CX-6 will have B-pillar reinforcements in the 1,500 MPa range, similar to the 2013 Lexus GS.

Notes

Objectives Worksheet

Mazda has made progress on a new bumper cover material featured on the 2013 CX-5. This bumper cover material combines polypropylene (PP) with rubber. This material will be used on future Mazda models, since there is a weight reduction. The material repairs and refinishes the same as standard PP.

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Topic C. Mazda (cont'd)

C-2

Mazda "SKYACTIV" Technology

Courtesy of Mazda Motor Corp.

Mazda is lightening the vehicle by redesigning the powertrain, called "SKYACTIV" technology.

The primary feature of SKYACTIV technology is the engine, which has an exceptionally high compression ratio of 13:1, similar to Formula One race cars. By redesigning other parts of the drivetrain, Mazda was able to overcome the disadvantages of high compression, such as poor fuel efficiency.

In Europe and Asia, the CX-5 is available as a diesel.

Notes

The engine on the screen, the SKYACTIV-G refers to "gasoline" engine. Mazda also makes a SKYACTIV-D diesel engine, but it is not available in the United States.

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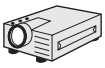
Topic C. Mazda (cont'd)



C-3v

Video: Tech/Trends Trivia

Notes

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Topic D. Subaru

D-1

Eyesight Driver Assistance

Forward-Facing Cameras

The 2013 Subaru Legacy and Outback have an autonomous braking feature option called Eyesight Driver Assistance, which:

- automatically applies the brake when the vehicle is traveling up to 19 mph and in situations where the driver should but does not brake.
- combines adaptive cruise control, pre-collision braking, lane departure, and sway warning into this one system.
- also includes a feature called Lead Vehicle Start Alert which alerts the driver when, after stopping, the vehicle in front starts moving.
- has two forward-facing cameras on the upper console, either side of the rearview mirror, as the main identification parts.

Notes

Objectives Worksheet

The 2013 Subaru Legacy and Outback have an autonomous braking feature option called Eyesight Driver Assistance.

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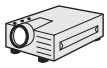
Topic D. Subaru (cont'd)



D-2

Eyesight Driver Assistance (cont'd)

The Eyesight Driver Assistance system:

- includes a caution label on the headliner that warns to never touch or wipe the camera lenses, which could damage or contaminate the lens.
- autonomous braking feature can be overridden by the driver at any time by simply applying the brakes.

Though Eyesight Driver Assistance is only available as an option on the 2013 Legacy and Outback, it should spread to other Subaru models in the future.

Notes

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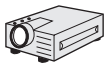
Topic E. Toyota/Lexus/Scion



E-1

Lexus GS 350

= 1,500 MPa Steel

What stands out on the 2013 Lexus GS from a body point of view is the strength of the hot-stamped, boron-alloyed steel in the B-pillar and roof rail reinforcements. It is rated at 1,500 MPa. This is the strongest steel to date used by Lexus or Toyota. Previous Lexus and Toyota vehicles have UHSS with a maximum strength of 980 MPa.

Also on the Lexus GS:

- is an aluminum hood, door skins, and bumper reinforcement.
- there are sectioning procedures on the front and rear rails, outer pillars, and rocker panels.

Notes

Objectives Worksheet

What stands out on the 2013 Lexus GS from a body point of view is the strength of the hot-stamped, boron-alloyed steel in the B-pillar and roof rail reinforcements. It is rated at 1,500 MPa. Also on the Lexus GS are an aluminum hood, door skins, and bumper reinforcement

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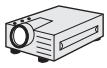
Topic E. Toyota/Lexus/Scion (cont'd)



E-2

Lexus GS 450h–The Hybrid Version

The hybrid version of the Lexus GS 350 is the GS 450h, which has a:

- vertically stacked nickel-metal hydride high voltage battery. The stacking of the battery is for adding room in the trunk area.
- night view infrared system option. Parts of the system include a camera in front of the rearview mirror, infrared lamps within the headlamp assemblies, and a display on the dash.

Notes

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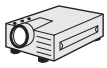
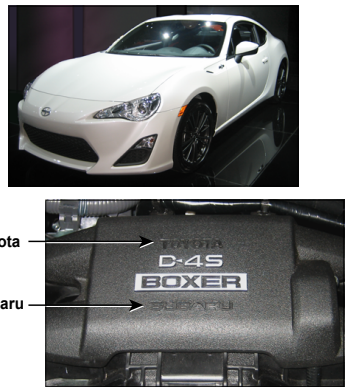
Topic E. Toyota/Lexus/Scion (cont'd)



E-3

New Scion For 2013: FR-S



There is a new Scion for 2013, the FR-S. The FR-S is a compact rear-wheel drive sports car. That is what FR-S stands for: Front-engine, Rear-wheel drive, Sport. The FR-S:

- four-cylinder engine is the result of a joint effort between Toyota and Subaru. The FR-S platform is also shared with Subaru for the 2013 Subaru BRZ.
- contains 1,500 MPa steel on the roof crossmember that spans between the B-pillars. There are no repairs allowed on the roof or floor crossmembers that are HSS or stronger. On all Toyota, Lexus, and Scion vehicles, these crossmembers are considered structural reinforcements, and Toyota forbids straightening structural reinforcements.
- contains 980 MPa steel on the B-pillar and roof rail reinforcements, and the front roof crossmember.
- has sectioning procedures on the lower front rails and the outer A-pillars, outer rocker panels, outer B-pillars, and quarter panels. The rearmost portion of the trunk floor pan can also be sectioned.

Notes

Objectives Worksheet

There is a new Scion for 2013, the FR-S. The FR-S is a compact rear-wheel drive sports car. The four-cylinder engine is the result of a joint effort between Toyota and Subaru. The FR-S platform is also shared with Subaru for the 2013 Subaru BRZ.

The FR-S:

- contains 1,500 MPa steel on the roof crossmember that spans between the B-pillars. There are no repairs allowed on the roof or floor crossmembers that are HSS or stronger.
- has sectioning procedures on the lower front rails and the outer A-pillars, outer rocker panels, outer B-pillars, and quarter panels. The rearmost portion of the trunk floor pan can also be sectioned.

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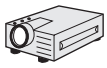
Topic E. Toyota/Lexus/Scion (cont'd)



E-4

Toyota Prius Family Grows

There is another Toyota Prius hybrid model for 2013. The Prius C, for "city":

- is the fourth Prius model to be offered. Previous Prius models include the Prius, now in its third generation, the Prius "V" wagon, and the Prius plug-in hybrid.
- is based on the Yaris platform. The Prius C is smaller than the original Prius and also has a smaller engine.
- has an aluminum hood and rear hatch.
- has a 144-volt NiMH battery under the back seat. The seat support frame is also the battery module protection area.

The Prius C is still a full hybrid.

Notes

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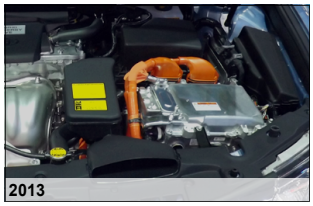
Topic E. Toyota/Lexus/Scion (cont'd)

E-5

Toyota Camry Hybrid Cable Routing



On the Toyota Camry Hybrid, Toyota has rerouted a pair of high voltage cables so they are less vulnerable in a collision. The connections:

- are to the hybrid inverter/converter under the hood. As with most high voltage cables, they are colored bright orange.
- were formerly connected in front, a potentially vulnerable position. This was pointed out in the "I-CAR Hybrid Electric And Alternative Fuel Vehicles (ALT02)" course.
- are now on the backside of the inverter/converter.

Notes

Objectives Worksheet

On the Toyota Camry Hybrid, Toyota has rerouted a pair of high voltage cables so they are less vulnerable in a collision. The connections are to the hybrid inverter/converter under the hood. Formerly in front, the cables are now connected on the backside of the inverter/converter. As with most high voltage cables, they are colored bright orange.

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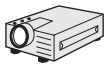
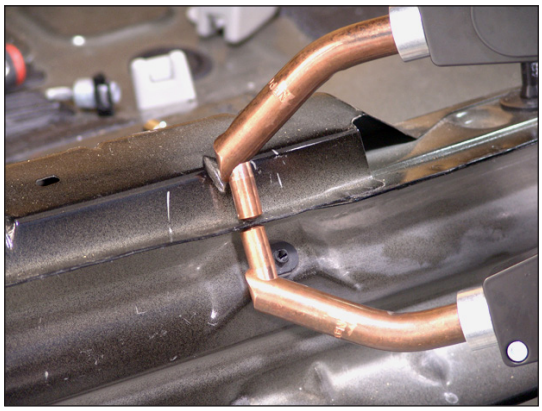
Topic E. Toyota/Lexus/Scion (cont'd)



E-6

Toyota Welding Substitutions



A Toyota Collision Repair Information Bulletin (CRIB) issued in December 2011 authorizes the use of spot welding for several repairs calling for GMA (MIG) plug welds in the service information. This includes everything from exterior panel pinchweld areas to structural applications, such as rail flanges.

CRIB number 181 specifies that the repair spot welds should match factory weld size, strength, and appearance. Strength can only be validated by destructive testing on sample metal of the same thickness and composition as the vehicle part being welded. If the repair welds are larger or smaller than the factory welds, the electrode tips should be resized as necessary to match. If size, strength, and appearance are matched, it is only required to match the same number of factory spot welds, not add one-third more, as the Toyota service information has long maintained. Repair spot welds should not be made over factory spot welds.

Notes

Objectives Worksheet

A Toyota Collision Repair Information Bulletin (CRIB) issued in December 2011 authorizes the use of spot welding for several repairs calling for GMA (MIG) plug welds in the service information. This includes everything from exterior panel pinchweld areas to structural applications, such as rail flanges.

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Topic E. Toyota/Lexus/Scion (cont'd)

GMA (MIG) plug welds should be used in areas where the spot welding arms cannot access both sides of the flange, and where spot welding strength does not prove adequate in the test welding process.

CRIB 181

Notes

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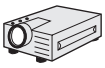
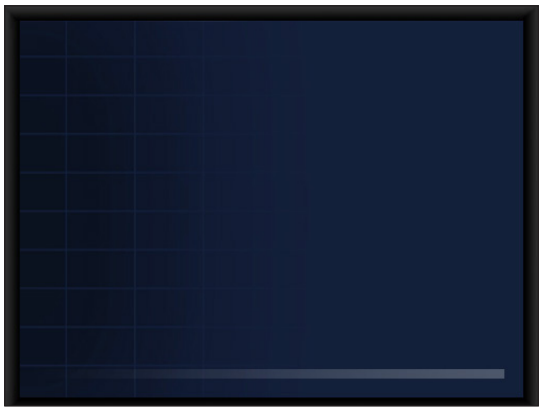
Topic E. Toyota/Lexus/Scion (cont'd)



E-7v

Video: Tech/Trends Trivia



Notes

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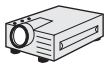
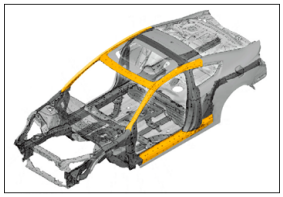
Topic F. Conclusion



F-1

Conclusion



Topics covered in this module included features on new vehicles and technology from:

- Honda/Acura.
- Infiniti.
- Mazda.

Notes

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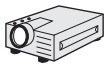
Topic F. Conclusion (cont'd)



F-2

Conclusion (cont'd)

Topics covered in this module included features on new vehicles and technology from:

- Subaru.
- Toyota/Lexus/Scion.

Notes

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Vehicle Technology and Trends 2013

Module 4

I-CAR®

Class 0:25

A-1

MODULE 4–EUROPEAN VEHICLE MAKERS

Topic A. BMW

Learning Objectives

The learning objectives for this module include describing features on new vehicles and technology from:

- **BMW.**
- **Land Rover**
- **Mercedes-Benz.**
- **Porsche.**
- **Volkswagen.**

The learning objectives for this module include describing features on new vehicles and technology from:

- BMW.
- Land Rover
- Mercedes-Benz.
- Porsche.
- Volkswagen.

Notes

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Topic A. BMW (cont'd)

A-2v

Video: Tech/Trends Trivia

Notes

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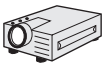
Topic A. BMW (cont'd)



A-3

BMW Pure-Electric ActiveE

The BMW pure-electric ActiveE:

- is based on the 1 Series Coupe.
- has an electric motor mounted between the rear wheels.
- has a lithium-ion battery pack.
- is available for lease-only and only in select areas.

Notes

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Topic A. BMW (cont'd)

A-4v

Video: Aluminum On BMW ActiveHybrid 5

This video highlights the aluminum parts on the 2013 BMW ActiveHybrid 5.

Notes

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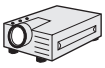
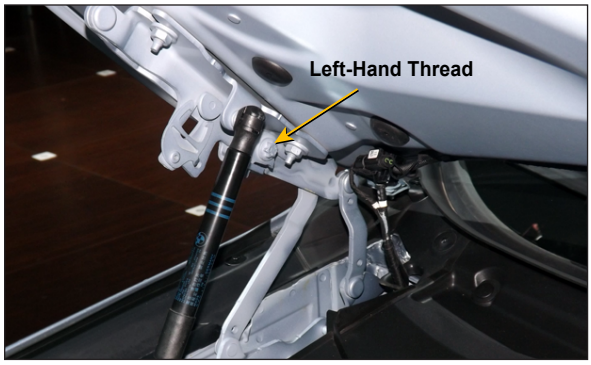
Topic A. BMW (cont'd)



A-5

Hood Hinges On BMW ActiveHybrid 5



The BMW ActiveHybrid 5 has complex hood hinges that:

- can bend out-of-parallel in a collision. The hinges must be replaced if they are out-of-parallel.
- include a left-hand thread bolt on the hood side.
- are pyrotechnic in the European and Asian markets. These areas have more pedestrian traffic than in the U.S. and pedestrian protection is required on all vehicles. An actuator on the bottom lifts the hood up a few inches in the back to provide a cushion. Equipped vehicles also have three sensors in the bumper trim and a control module.

These complex hood hinges are on the conventional and ActiveHybrid 5 Series and 7 Series. The current plan is to equip all U.S. models with these hinges starting with the newest generation of the 7 Series moving forward.

Notes

Objectives Worksheet

The BMW ActiveHybrid 5 has complex hood hinges that:

- include a left-hand thread bolt on the hood side.
- are pyrotechnic in the European and Asian markets. These areas have more pedestrian traffic than in the U.S. and pedestrian protection is required on all vehicles.

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Topic B. Jaguar/Land Rover

B-1v

Video: Tech/Trends Trivia

Notes

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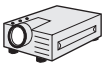
Topic B. Jaguar/Land Rover (cont'd)



B-2

All-Aluminum Land Rover Range Rover

Courtesy of Land Rover.

The fourth generation Land Rover Range Rover is the first aluminum-intensive vehicle for Land Rover. The plan is for all future Land Rovers and Jaguars to be aluminum-intensive. There have been aluminum-intensive Jaguars since 2003 with the launch of the XJ. The Range Rover will be a 2013 or 2014 model, and is:

- completely aluminum. The weight savings of the aluminum body compared to the previous steel body is 180 kg (397 lb). Overall, the vehicle weighs 420 kg (926 lb) less than the previous Range Rover.
- a unibody, just like previous steel Range Rovers. The Range Rover Sport, a smaller version of the full-size Range Rover, is a full-frame vehicle. For now, the Range Rover Sport stays with steel construction.
- the first sport-utility vehicle (SUV) in the world to be aluminum-intensive.

Notes

Objectives Worksheet

All future Land Rovers and Jaguars will be aluminum-intensive. There have been aluminum-intensive Jaguars since 2003 with the launch of the XJ. The 2013 or 2014 Range Rover is the first aluminum-intensive vehicle for Land Rover. The new Range Rover is a unibody, just like previous steel Range Rovers.

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Topic B. Jaguar/Land Rover (cont'd)

The aluminum body is rivet bonded at the factory with self-piercing rivets. The entire part is pressed as a single aluminum panel, thus reducing the number of joints, eliminating complex assemblies, and improving structural integrity.

Notes

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Topic C. Mercedes-Benz

C-1v

Video: Mercedes-Benz SL

This video highlights some of the features on the 2013 Mercedes-Benz SL.

Notes

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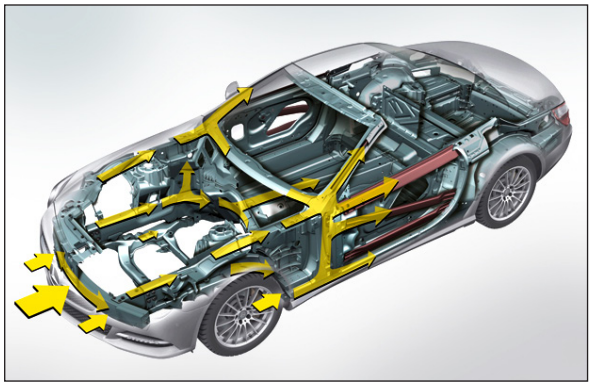
Topic C. Mercedes-Benz (cont'd)

C-2

Aluminum On The Mercedes-Benz SL 550



Courtesy of Daimler AG

The original SL in 1952 had a steel tubular frame. On the 2013 SL 550, there are few parts that are not aluminum. 44% of the vehicle is cast aluminum, 17% extruded aluminum, and 28% sheet aluminum. The Mercedes-Benz SL 550:

- has boron-alloyed tubular steel in the upper A-pillars. The windshield frame exterior is steel sheet metal. This is the only steel on the body of the vehicle. The rear body panel has some magnesium, the rest of the body is aluminum.
- includes a cast aluminum cowl panel.
- has an aluminum transmission tunnel that is tailor-welded to three different thicknesses.

The 2013 SL 550 has an electrochromatic glass roof option. This technology darkens the glass instantly when a button is pushed.

Notes

Objectives Worksheet

On the 2013 Mercedes-Benz SL 550, there are few parts that are not aluminum. There is boron-alloyed tubular steel in the upper A-pillars. The windshield frame exterior is steel sheet metal. This is the only steel on the body of the vehicle. The rear body panel has some magnesium, and the rest of the body is aluminum, including a cast aluminum cowl panel.

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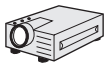
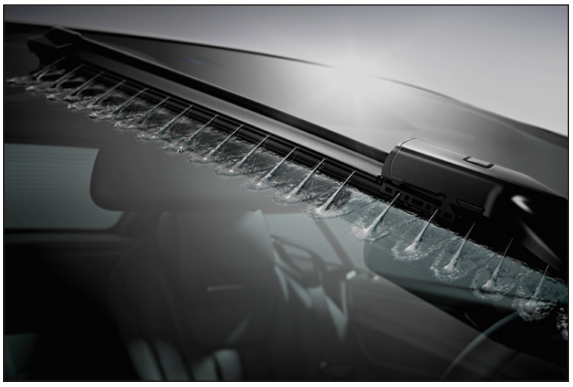
Topic C. Mercedes-Benz (cont'd)



C-3

Magic Windshield Wipers On The Mercedes-Benz SL 550



Courtesy of Daimler AG

The 2013 Mercedes-Benz SL 550 has a new type of adaptive windshield washing system called "Magic Vision Control" which:

- channels the windshield washing fluid through the wiper blades, instead of jets which direct the fluid at the windshield.
- directs the fluid to squirt out of tiny holes directly in front of the wiper blades, for efficient control of the cleaning process. The "magic" name of the system is because the driver cannot see the fluid squirting out of the holes.
- automatically adjusts the fluid/water solution for freezing temperatures or the heat of the summer. Also, the wipers and wiper blades are heated so they do not build up with snow or ice.
- automatically reduces the amount of fluid squirting out when the hardtop is down on the Cabriolet model, preventing fluid from splashing into the vehicle interior.

Notes

Objectives Worksheet

The 2013 Mercedes-Benz SL 550 has a new type of adaptive windshield washing system called "Magic Vision Control" which channels the windshield washing fluid through the wiper blades, instead of jets which direct the fluid at the windshield.

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Topic D. Porsche

D-1v

Video: Aluminum On The Porsche 911 Carrera

This video highlights the aluminum parts on the 2013 Porsche 911 Carrera and 911 Carrera S.

Notes

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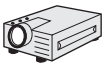
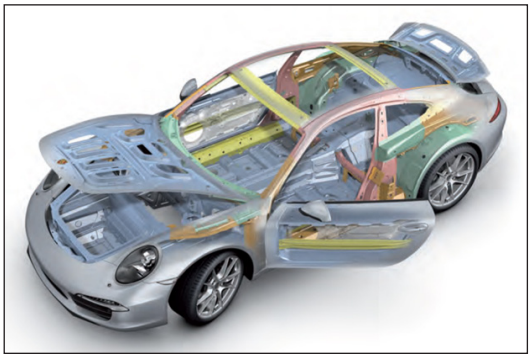
Topic D. Porsche (cont'd)



D-2

Porsche 911 Carrera Repairs



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This new body style is on the Porsche 911 Carrera (991) generation, both the 911 Carrera and the 911 Carrera S. When making repairs on the new 911 Carrera and 911 Carrera S:

- replace self-piercing rivets (SPRs) with blind rivets and adhesive. The rivets have a special corrosion-protection coating and must be ordered from Porsche.
- replace flow drill screws with flow drill screws and adhesive.
- there are welds, both spot welds and GMA (MIG) welds, specified in the repair information.

Notes

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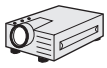
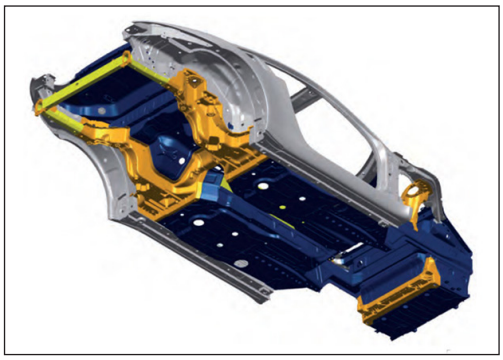
Topic D. Porsche (cont'd)



D-3

Porsche 911 Carrera Repairs (cont'd)



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Some interesting instructions in the Porsche 911 Carrera (991) service information includes:

- a requirement that when parts are replaced with adhesive, wait at least 48 hours before releasing the vehicle to the customer.
- an aluminum front lower rail sectioning procedure that calls for blind rivets, countersunk screws, and adhesive. No welds are made in the sectioning procedure.

Notes

Objectives Worksheet

The Porsche 911 Carrera (991) service information includes a sectioning procedure on the aluminum front lower rails that calls for blind rivets, countersunk screws, and adhesive. No welds are made in the sectioning procedure

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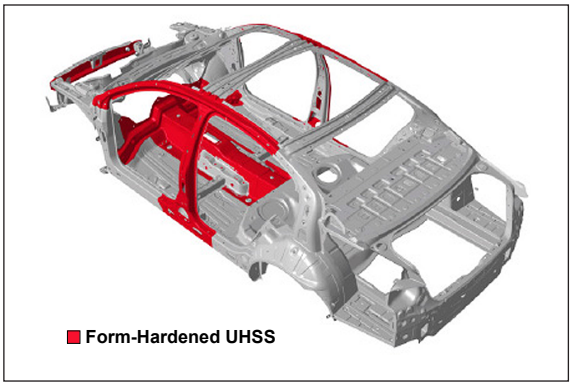
Topic E. Volkswagen

E-1

Form-Hardened UHSS On VW Passat



The Volkswagen Passat, which was redesigned for 2012, has form-hardened UHSS on several parts of the passenger compartment. Form-hardened steel:

- is hot-stamped, boron-alloyed steel that is cooled along the length of the part at different rates.
- results in different strengths along the part with no visible indications. There are no seams, no laser welds.

Form-hardening technology was first used on the 2010 Audi Q5, and is now used on most Audi/ Volkswagen vehicles.

Notes

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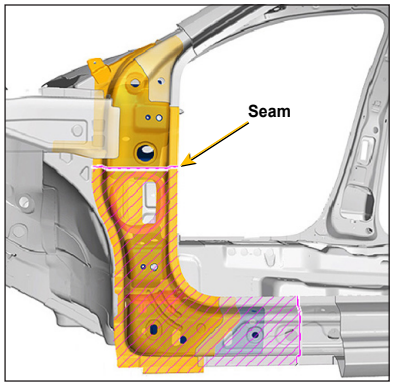
Topic E. Volkswagen (cont'd)

E-2

Repairs On The Volkswagen Passat



Regarding repairs on the Volkswagen Passat, there:

- is a new sectioning procedure on the lower A-pillar reinforcement, just beneath where the upper rail attaches. A foam insert directly behind the joint must be removed, and a new insert installed during the procedure. A GMA (MIG) open butt joint is made along the seam.
- are sectioning procedures on the rocker panel reinforcement, front upper/lower and rear rails, and the trunk floor.

Notes

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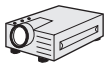
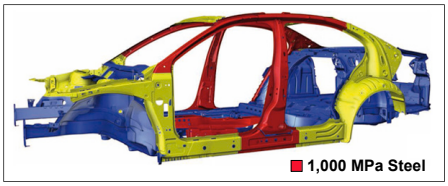
Topic E. Volkswagen (cont'd)



E-3

VW Jetta Hybrid



There is a hybrid version of the Volkswagen Jetta. The Jetta Hybrid:

- is a full parallel hybrid, with a 220-volt lithium-ion battery pack mounted behind the rear seats.
- has a coasting mode, where the engine is decoupled from the drivetrain when the driver releases the accelerator at speeds up to 84 mph.
- has sectioning procedures on the upper and lower front rails, outer A/B-pillars, rocker panels, rear rails, and quarter panels.

Notes

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Topic E. Volkswagen (cont'd)

E-4v

Video: Tech/Trends Trivia

Notes

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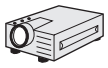
Topic F. Conclusion



F-1

Conclusion

Topics covered in this module included features on new vehicles and technology from:

- BMW.
- Land Rover.
- Mercedes-Benz.

Notes

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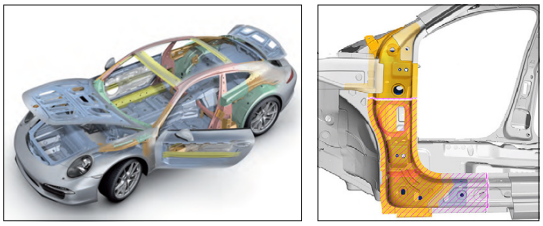
Topic F. Conclusion (cont'd)

F-2

Conclusion (cont'd)



Topics covered in this module included features on new vehicles and technology from:

- Porsche.
- Volkswagen.

Notes

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Vehicle Technology and Trends 2013

Module 5

I-CAR®

Class 0:21

A-1

MODULE 5–CONTINUING TRENDS AND POSSIBILITIES

Topic A. Continuing Trends

Learning Objectives

The learning objectives for this module include identifying:

- **vehicle manufacturing trends that are continuing.**
- **innovations that may become trends in future model**

The learning objectives for this module include identifying:

- vehicle manufacturing trends that are continuing.
- innovations that may become trends in future models.

Notes

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Topic A. Continuing Trends (cont'd)

A-2

Search For Lightweight Materials

CAR
CENTER FOR AUTOMOTIVE RESEARCH

Reducing vehicle mass is one of the keys necessary to achieve the CAFÉ standard of 54.5 mpg by 2025. The options for lightweight materials are still too small, so the search for more options is underway. To that end, a coalition has been formed, and effort headed up by the Center for Automotive Research (CAR). The Coalition of Automotive Lightweighting Materials (CALM):

- combines the aluminum and plastics industries working with vehicle makers.
- involves more than 200 companies, including 3M, BASF, Michelin, PPG Industries, Plastic Omnium, Altair, EWI, Material Sciences Corp., Trexel, Shiloh Industries, and more.

Notes

More information on CALM can be found at the Center for Automotive Research website (www.cargroup.org) or by searching for Coalition of Automotive Lightweighting Materials.

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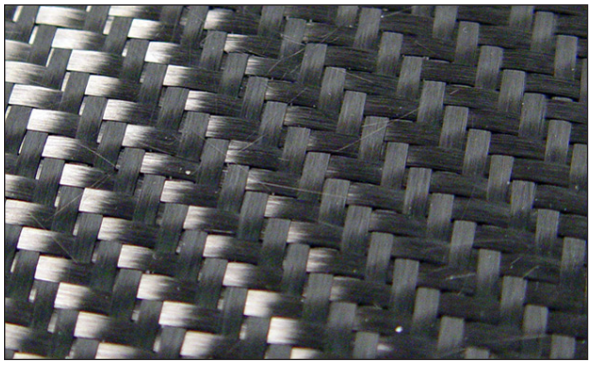
Topic A. Continuing Trends (cont'd)

A-3

Welcoming Carbon Fiber



One material getting a lot of attention is carbon fiber, so far limited to high-end vehicles and aftermarket accessories due to its high cost. Carbon fiber is:

- among the strongest, yet lightest, material available for vehicle bodies.
- being studied for how it could be produced in high volumes, thus reducing the cost.
- getting a lot of attention from Ford, which is teaming with Dow Automotive Systems to research the use of advanced carbon fiber composites. If the effort is successful, Ford is eyeing wide use in high-volume vehicles by the end of the decade. Dow has already partnered with Turkish carbon fiber maker AKSA and the U.S. Department of Energy Oak Ridge National Laboratory.

GM in 2011 paired with Teijin Ltd. to develop advanced carbon fiber composites.

Notes

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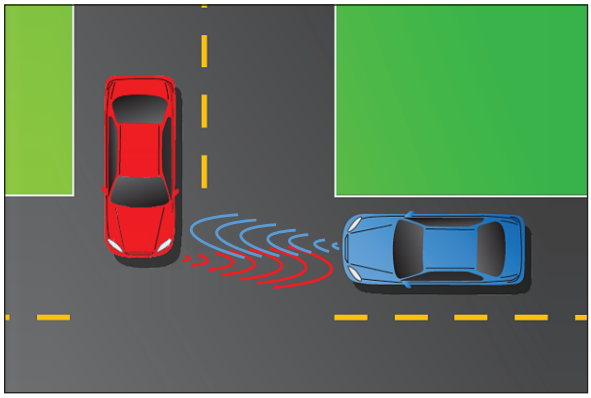
Topic A. Continuing Trends (cont'd)

A-4

Vehicles Talking With Each Other



Collision avoidance is still getting a lot of attention, especially from NHTSA, which sees vehicles talking with each other the next major safety breakthrough. This technology will:

- be done via a wireless network.
- communicate such factors as speed, location, direction, and location of traffic lights and work/school zones.
- only work if all vehicles are equipped.

This is not a new thought. The Federal Communications Commission in 1999 set aside part of the wireless spectrum for vehicle-to-vehicle communication. NHTSA began its study in 2002. In 2011, talks began with vehicle makers. NHTSA is considering mandating collision avoidance systems and that mandate would include vehicle-to-vehicle communication.

Notes

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Topic A. Continuing Trends (cont'd)

A-5

Autonomous Vehicles By Decade End

Courtesy of BMW

Autonomous vehicles, or vehicles that drive themselves, are closer to reality than many people realize. For example:

- GM is predicting there will be autonomous vehicles on the road by the end of the decade. GM is now road-testing a technology called "Super Cruise" on the Cadillac XTS, which is adaptive cruise control combined with self-steering and GPS guidance. The system lights up the steering wheel with a row of green LEDs when the driver can let go of the steering wheel. It is only operational when using cruise control.
- BMW and Audi have a number of test vehicles in operation. Google is testing an autonomous Toyota Prius.
- Volvo has successfully tested a platoon of four riderless vehicles on public highways. The platoon followed a lead vehicle, maintaining a set distance behind.
- U.S. states are starting to authorize legislation allowing autonomous vehicles. Nevada, in 2011, became the first state to approve leg-

Notes

More information on the GM Super Cruise can be found at: www.autoblog.com/2012/04/30/watch-cadillacs-new-semi-autonomous-super-cruise-in-action.

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Topic A. Continuing Trends (cont'd)

islation authorizing licenses to be issued for self-driving vehicles. New Jersey introduced similar legislation in 2012. Other states, such as California and Florida, are considering it. All of the legislations require a person sitting in the driver's seat. The driver can be relaxed, but fully aware of what is going on, ready to take control of the vehicle when necessary.

- the technology to operate autonomous vehicles already exists. Vehicle makers are now competing to put it all together and introduce the first model.

Members of the Institute of Electrical and Electronics Engineers, a professional organization dedicated to advancing technology, have selected autonomous vehicles as the most viable form of intelligent transportation, anticipating that they will account for up to 75% of vehicles on the road by the year 2040.

Notes

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Topic A. Continuing Trends (cont'd)

A-6v

Video: Tech/Trends Trivia

Notes

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Topic A. Continuing Trends (cont'd)

A-7

Unplugged Hybrid Charging

Infiniti LE Concept

Instead of plugging in an electric vehicle for charging, it will soon be possible to just have to park the vehicle in a certain location for charging purposes. The unplugged hybrid charging technology:

- is done via an inductive pickup that would be located on the bottom of the vehicle.
- would automatically begin when a vehicle fitted with a charging coil is positioned over the charging coil in the ground.
- is getting serious looks by Mercedes-Benz, which has been doing test runs on the A-Class.
- is getting serious looks by Volvo, which has been experimenting.

The vehicle shown is a concept Infiniti LE. Infiniti says the concept represents an 85% accurate view of the production model, which should arrive in 2015. The inductive charging mat, which is designed to fit on a garage floor, is predicted to become the first such mat commercially available.

Notes

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Topic A. Continuing Trends (cont'd)

A-8

New Lithium Battery

An ongoing issue with lithium-ion batteries is the chance that they can catch fire after a severe collision. A proposed new type of lithium-iron-phospate battery:

- stores 10% less energy than lithium-ion technology.
- has a lower chance of catching fire after a severe collision.
- is already targeted for the electric version of the Chevrolet Spark.

Notes

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Topic A. Continuing Trends (cont'd)

A-9

Electric Highways Opening

Nissan Leaf

The issue with pure-electric vehicles, like the Nissan Leaf, is that there is a travel limit due to the need for recharging. So-called electric highways would have charging stations at regular intervals, and the first of these highways is already starting to open.

The first phase of the West Coast electric highway, I-5 in southern Oregon, is open. Eventually, the highway will extend into Canada.

Notes

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Topic A. Continuing Trends (cont'd)

A-10v

Video: Volvo "You" Concept

This video shows some features of the concept Volvo centered around the vehicle owner.

Notes

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Topic A. Continuing Trends (cont'd)

A-11

Future Of Drying

Imagine if a spraybooth could dry and cure refinishing material in less than three minutes. The Symach Robodry (SY-mak ROE-boe-dry) system:

- is being used in Europe and Australia today. The company is based in Italy.
- is scheduled to come to the U.S. in 2014.
- uses natural methane gas passing through catalysts and oxygen to create infrared energy. The concentrated infrared energy follows the profile of the vehicle along the sides, top, and bottom, maintaining an even distribution.
- can be programmed for several different types of coatings and body fillers.

Notes

More on this technology can be found at www.fenderbender.com. Do a search for "The Future of Paint Drying."

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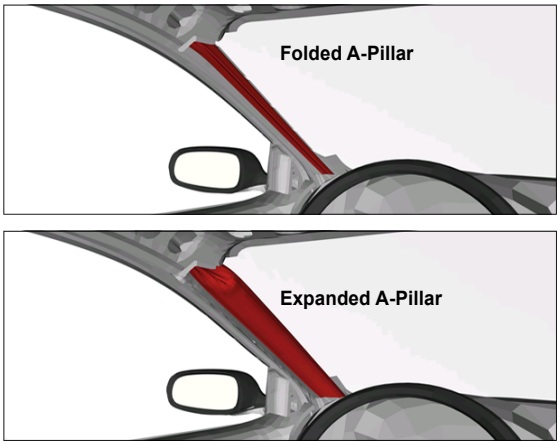
Topic A. Continuing Trends (cont'd)

A-12

Expandable Upper A-Pillar



Courtesy of Autoliv

To pass roof crush tests, it is essential to have strong A-pillars, but that can add weight and thickness. One proposed solution is an expandable A-pillar, which:

- in its relaxed state, is three-times thinner than normal. This provides a better view of the road and intersections, and also less weight.
- in a collision, deploys by expanding and increasing the stiffness by 45%. The steel pillar itself expands, not an airbag within the pillar.
- is proposed by a major airbag maker (Autoliv).

Notes

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Topic A. Continuing Trends (cont'd)

A-13

VW Electronic Sun Visor

Volkswagen engineers are coming close to solving the problem of a driver being blinded when they are driving into morning or evening sun. They call it an electronic sun visor, which:

- has sensors to look at the driver's eye position and the sunrays reaching the windshield, to sense where the sun is most blinding on the driver's eyes.
- has a computer to combine the sensor information and darken only that section, and change the darkened section as the vehicle goes around curves and turns.
- uses similar technology as electrochromatic glass, which darkens the entire glass with the push of a button.
- would require a special windshield. The technology would only be applied to the top area of the windshield, as there is an effect on glass clarity, but it is said to be much better than sun visors used today.

Notes

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Topic A. Continuing Trends (cont'd)

The technology is still in the developmental stage. The long-term objective is broad coverage, including side glass, and blocking the glare of oncoming headlamps.

Notes

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Topic A. Continuing Trends (cont'd)

A-14

Moving B-Pillar On European Ford B-MAX

Courtesy of Ford Motor Company

The Ford B-MAX, currently only in Europe, has moving B-pillars in the hinged front and sliding rear doors, which:

- are fitted with ultra-high strength steel brackets called "crash catchers" that lock the doors together if the vehicle is hit in the side.
- provide side-impact protection when the doors are closed and latched. More than 5,000 computer simulations and 140 physical side-impact crashes were done. Because of these successful crash tests, the vehicle could be heading for the U.S. market.

Notes

An article and photo on a crash test on the B-MAX B-pillar can be found at www.sae.org/mags/AEI/10996.

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Topic A. Continuing Trends (cont'd)

A-15v

Video: Tech/Trends Trivia

Notes

Use this last trivia question as a tie breaker, if necessary. The person who comes closest to the correct answer wins this one.

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Topic B. Future Possibilities

B-1

Terrafugia Transition Air Car

For those who cannot figure out whether to go by road or through the air, there is the Terrafugia (ter-ah-FEW-jee-ah) Transition, the first commercially available air car. The Transition:

- is a street-legal airplane. It can be driven on any road and parked in a standard parking space or household garage.
- rides on the highway like any other vehicle, and turns into a plane by unfolding the wings in about 40 seconds. In order to take to the air, it needs at least 2,500 feet of runway, which nearly all airports have. In the cockpit there is both a steering wheel for driving, and a control stick for flying. The folding wing mechanism is in its fourth generation of development.
- is still in the prototype stage, but the company is taking orders.
- has a carbon fiber "safety cage" around the occupants and a carbon fiber driveshaft that connects the engine to a power takeoff, which spins the propeller in the rear. When in the drive mode, the power takeoff disengages from the

Notes

More information on the Terrafugia Transition can be found at www.driventofly.com.

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Topic B. Future Possibilities (cont'd)

propeller and connects to a belt that drives a continuously variable transmission to turn the rear wheels. The propeller is locked in position.

- follows the necessary federal motor vehicle safety standards, including driver and passenger airbags, an energy-absorbing crumple zone made of aluminum, an independent front suspension, and a rearview camera. There is also a safety parachute that deploys from the rear of the hood, if necessary. Door mirrors retract when the vehicle is being used as an airplane.

Notes

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Topic B. Future Possibilities (cont'd)

B-2

Hydrogen Economy In 2015

Toyota FCV-R

The dream of a fuel cell vehicle that runs on hydrogen and exhausts only water is still alive. At least six companies are launching fuel cell vehicles (FCVs). Many have targeted 2015 for mass production. Evidence of these efforts include:

- GM, which coined the phrase "hydrogen economy," is still promoting the Chevrolet Equinox, a fuel cell SUV.
- Honda keeping alive the FCX Clarity, which is being leased by several customers, primarily in Southern California where there are the most hydrogen fueling stations.
- Hyundai, which has produced a Blue Will FCV, recently confirmed a goal of producing 10,000 fuel cell vehicles annually by 2015.
- Mercedes-Benz showcasing a fuel cell B-Class. It received the prestigious eCar Award in 2012.
- Toyota planning on a commercial rollout of a fuel cell vehicle in 2015. Toyota says it will look similar to the FCV-R that was on display at auto shows in 2012.

Notes

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Topic B. Future Possibilities (cont'd)

The primary hurdle for hydrogen-fueled vehicles is establishing an infrastructure of hydrogen fueling stations.

Notes

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Topic B. Future Possibilities (cont'd)

B-3

Toyota Mood Sensors

Similar to the popular "mood ring" of the mid-70s, Toyota engineers are working on a mood sensing electronic system that:

- determines the emotional state of the driver.
- customizes safety alert systems based on the sensor information.
- is based on a study that shows sad or angry drivers have delayed reaction times. So if the system senses that the driver is upset or angry, there will be more time allotted to give the driver more time to react. If the driver is sensed at being neutral, the standard alert times will apply.
- uses several sensors looking at the driver's face and the driver's position in the seat.

The technology is still years away from production.

Notes

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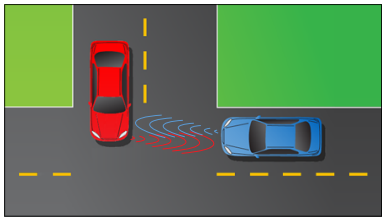
Topic C. Conclusion

C-1

Conclusion



Topics covered in this module included:

- continuing vehicle manufacturing trends.
- possible future trends.

Notes

Remind the students that the Program CD-ROM includes copies of the: video scripts.

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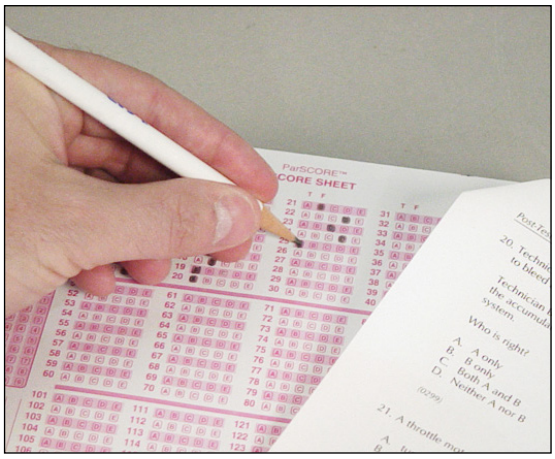
Topic C. Conclusion (cont'd)

C-2

Post-Test



Before beginning the post-test, the answer sheets need to be correctly filled out. Any missing information will delay the issuing of credit for this program. Have the students clearly fill in their:

- I-CAR ID number.
- phone number.
- name, leaving a space between the last and first name, and between their first name and middle initial.
- test form letter (A or B) under **TEST FORM**. The test form letter appears in the upper right corner of the Post-Test Question Booklet.

Notes

It is very important that the students properly fill out the answer sheet before starting the Post-Test.

When filling out the I-CAR ID Number portion of the Scantron answer sheet place two zeros (00) in front of the I-CAR ID Number or use a full SSN/SIN.

Contesting A Question
All questions contained in this Post-Test have been carefully developed and reviewed. If, however, a student feels that a question has multiple answers or is incorrect in any way, they still must answer it with what they feel is the best answer. They can then also darken the letter E on the form for that question and write their concern on the back of the form. This is only to alert staff of a student's concern and does not mean the student is not responsible for answering the question correctly.

This process is to be used in extreme situations where a student feels strongly that there is a problem with a question and brings it to the attention of the Instructor/Administrator, and should not be announced to the class.

Topic C. Conclusion (cont'd)

Notes

The students also need to clearly write in the:

- instructor's name on the line appearing after **INSTRUCTOR NAME**.
- Post-Test Question Booklet number on the line appearing after **PROGRAM TEST VERSION**. This number is located on the upper left corner of the question booklet after the word **PROGRAM TEST VERSION**.
- date of the class on the line appearing after **DATE**.

Direct the students to answer all questions in the question booklet using the appropriate area on the answer sheet. Use a pencil to darken the circle which represents the best answer to the question. There is only one correct answer for each question.

The answer sheet is electronically scanned, so questions will not be scored as correct if they are:

- answered with more than one answer.
- not clearly marked on the answer sheet.
- mistakenly marked and not completely erased.
- completed in ink.

At the completion of the Post-Test, students are to hand in both the completed answer sheet and the question booklet. Students are not allowed to keep the question booklets. It is the Post-Test administrator's responsibility to make sure that all test booklets are returned to I-CAR with the answer sheets. Post-Test questions are changed often and printed "on demand," so there is no advantage to keeping the question booklets.

Topic C. Conclusion (cont'd)

Place the Post-Test and the completed answer sheets in the provided envelope and mail them to I-CAR for scoring. Students will be informed of their test results upon scoring of the tests and processing by I-CAR.

Notes